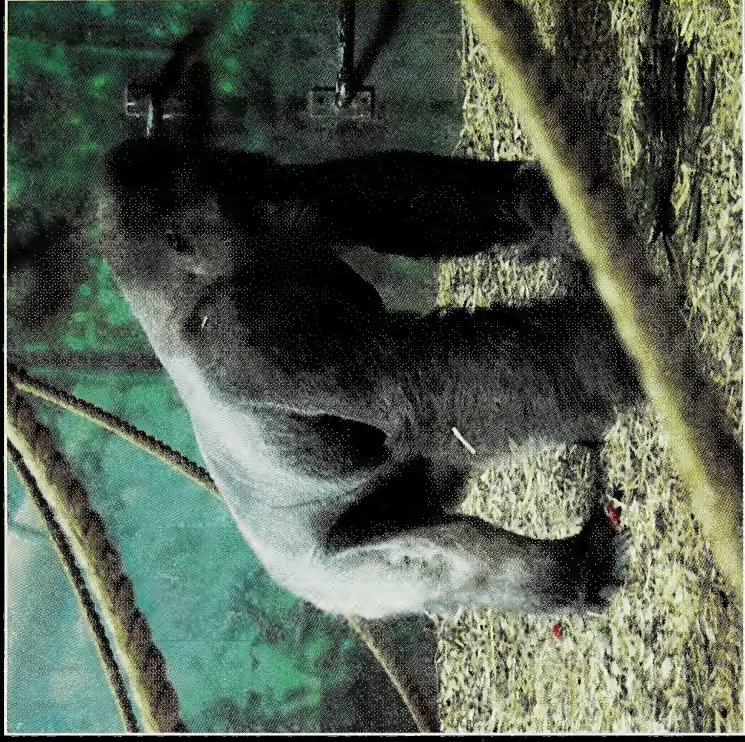


ANIMAL KEEPERS' FORUM

Special Dedicated Issue on the Care and Management of Geriatric Animals in Zoos



April/May 2009



*The Journal of The American
Association of Zoo Keepers, Inc.*

ANIMAL KEEPERS' FORUM, 3601 S.W. 29th St., Suite 133, Topeka, KS 66614-2054

Phone: (785) 273-9149 FAX (785) 273-1980

April/May 2009
Vol. 36, Nos. 4/5

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Animal Keepers' Forum is published monthly by the American Association of Zoo Keepers, Inc., 3601 S.W. 29th Street, Suite 133, Topeka, KS 66614-2054. Ten dollars of each membership fee goes toward the annual publication costs of Animal Keepers' Forum. Postage paid at Topeka, KS.

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About the Cover....

Featured on the cover of this special issue of *Animal Keepers’ Forum* is 1.0 Western lowland gorilla (*Gorilla g. gorilla*) “Timmy”. These photos of “Timmy” show how he has aged between the photo on the left taken at Cleveland Metroparks Zoo by Jan Parkes when he was 29 years old; and the photo on the right taken at the Louisville Zoo by Michele Long at his current age of 50 years old. We thank Jan Parkes and Michele Long for allowing us to use these photos for our cover.

Be sure to read more about “Timmy” in the article by Roby Elsner that can be found on pages 177-186 of this issue of *AKF* dedicated to the care and management of geriatric zoo animals.

Remembering the Golden Girls

This issue of the *Animal Keepers' Forum* is dedicated to the animals that are known as geriatric in the zoo industry. As keepers, we know they are so much more than that. If zoo animals were to have their own union, the geriatrics would have top seniority, and all of the perks that come with it. They would receive the meatiest bone, a favorite enrichment device, or the largest bed of straw. They are the animals that have lived an entire lifetime in our zoos, or were recruited from the wild as youngsters to serve as an ambassador for the ones they left behind. They have adapted to a captive life and thrived. In many cases, they have seen keepers come and go, or in rare circumstances they have known the same keeper over a lifetime, forming an extraordinary bond. In most cases their lifespan was much longer than it would have been in the wild, with threats like predators, drought, and poaching removed from their daily worries. The tradeoff for long lifespan usually involves the encroachment of diseases and ailments that their wild conspecifics would never face. As keepers, our final gift to these geriatrics is to ease them through the challenges and discomforts of their golden years. Possibly more than any other animals in the zoo, geriatrics validate what we do as keepers. They are proof that our husbandry, vet care, enrichment, training, and exhibits have achieved success. I'd like to introduce to you to some of the golden girls from my career.

Windhoek was the most regal cheetah I have ever seen. Raised by Laurie Marker during her days as a keeper, Windhoek came to my zoo as a young cat and lived well beyond her life expectancy. She shared her exhibit with two other cheetahs and two white rhinos, still one of the most unique exhibits I have ever seen. Windhoek had a sense of mischief that I always enjoyed, a wild spirit that was never tamed. I remember the time I spotted her stalking our male rhino, and in a spotted flash she dashed from the tall grass, leapt into the air, and swatted the rhino on his rump with all four paws, and was gone just as quickly before he even knew what hit him. Windhoek was always the last cheetah to come into holding in the evening, and usually needed to be rounded up by a couple keepers wielding brooms for protection. She would watch us from the same tall grass and reluctantly move into the holding area, planning her hiding strategy for the next day's roundup.

Twiggy was the matriarch of our giraffe herd. She roamed our African Plains exhibit with five other giraffes of mixed ages. A new keeper at the time, I quickly learned what every giraffe keeper knows, that the slightest change in routine would result in the giraffes stopping in their tracks and refusing to come in for the evening. A misplaced bucket, a rake hanging on the wrong hook, or a simple leaf that had blown into the entrance of their stall would be enough to send them running back towards the exhibit. Except of course for Twiggy, who would head directly for her feed, despite whatever obstacle this rookie keeper had left in view. More than I care to admit, I would rely on Twiggy, who was obviously frustrated with my attempts to move the herd back towards the stall, to leave her feed, walk back out into the exhibit and round up the herd herself. In her later years, as arthritis reduced her mobility, Twiggy's hooves started to become problematic. Lacking any sort of restraining device, the old girl would let my co-worker and I trim her hooves, a testament to the bond that geriatrics share with their longtime keepers.

Sophie was a Kodiak bear that outlived all of her cubs and reached a golden age of 40. Despite the arthritis that had ravaged her joints, the old sow would amble out to her pool and await what would become our morning ritual. High above from the bear roof, I would turn on the fire hose as Sophie backed into position. Aiming the hose into the water right behind her, we created the captive bear's equivalent of a whirlpool. Sophie came to expect her morning whirlpool action, in addition to all of the extra treats and enrichment that she received over the other bears in the building. Since she usually kept her straw clean and dry, her bedding often evolved into a mattress of straw thicker and wider than a king size bed.

These were the golden girls of my early days as a keeper. They are all gone now, and new geriatrics have taken their places. I know all of you have your own favorite animals, and they have their own challenges like arthritis, heart disease, diabetes, cancer, and many of the other same elements we may all eventually face in our own golden years. Collectively, you make a difference in these animals' lives every day. Hopefully this issue will help you meet some of the challenges associated with geriatric animal care. Thanks for all that you do as keepers, and for the care you give all of your animals, from the neonates to the golden girls in your own zoos.



Shane Good, AAZK President
Cleveland Metroparks Zoo

Acknowledgements from the Editor. . . .

This has been an amazing issue of *Animal Keepers' Forum* to work on and I thank all of the authors and photographers for the privilege and unique experience of putting together all of your insight, expertise and experience into this special dedicated issue. As zoo collection animals have continued to push the outside limits of their species' naturally expected lifespans, zoo staff have had to become more creative and inventive in the ways in which they deal with these geriatric animals.

We hope you will enjoy reading the many articles contained in this issue and will find useful information and techniques to apply to your own situations at your facilities. We have always known that Keepers Care, and the thoughtful and compassionate care they are currently giving to the geriatric animals in zoos across North America certainly reinforces this belief.

Again, many thanks to all who answered the Call for Papers for this dedicated issue - it exists because of your willingness to share.



Susan D. Chan, Managing Editor
Animal Keepers' Forum



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The Future is Now: New Strategies for Geriatric Care at the Oakland Zoo

*By Victor Alm, Lisa Clifton-Bumpass, Andrea Dougall, Andrea Goodnight, DVM,
Scott Holub and Amy Phelps, Staff Members, Oakland Zoo, Oakland, CA*

Advances in health care, nutrition and husbandry have allowed many zoo animals to reach ages that would be impossible in the wild. As animals in zoos grow older, veterinarians and husbandry staff are presented with new illnesses and degenerative conditions that must be addressed to keep aging animals comfortable and active in their "golden years". In developing a geriatric medical program, it is important to remember that old age itself is not a disease. There are conditions that tend to occur more often as animals age, especially chronic degenerative diseases such as arthritis. Additionally, neoplasia (cancer) and organ insufficiency (such as kidney failure) are more common as animals age. However, many conditions that may be age-related, such as hyperthyroidism, diabetes and obesity can be managed with medication and/or a healthy lifestyle, allowing animals to remain active and free of clinical signs of disease even when they are elderly.

The aging process can have different effects on each individual, thus no single geriatric medical protocol is sufficient for an entire collection. At the Oakland Zoo, veterinarians have developed a "life stage" program to ensure that each animal has a custom medical plan as it ages. Exams are used to diagnose medical conditions early, while they are more easily managed both medically and through husbandry techniques. Once the condition is diagnosed, the veterinary staff works closely with the keeper staff to create a multimodal treatment plan that may include Western medicine, alternative therapies, dietary modification and novel husbandry techniques.

Supervisory Support in the Implementation of Geriatric Animal Husbandry

Open communication and buy-in from your veterinary staff plays a vital role in the proactive and effective care of geriatric animals in our collections; then it is just as vital a role to have blanket supervisory support. Geriatric animals can come in all shapes, sizes, and species, and it is important that there is support from the various managers who are involved with their daily care, from the curator to the behavioral manager to the senior/lead keepers, as it truly is a team effort. The keepers who are responsible for the day-to-day care of these animals must be well supported, or their ability to meet the animal's changing needs is minimally effective or non-existent. Since we should always be thinking about the future as if it were now, the supervisor can play a vital role in establishing the foundation for geriatric care for the animals under his/her supervisory umbrella. This support can come in numerous forms such as defining and establishing goals, fostering communication, trust, and teamwork, and through management of resources.

Defining and establishing goals for husbandry and behavioral management is a good place for an area supervisor to start off when considering the care of geriatric animals. The supervisor can help bring together the keepers, veterinarians, and other supervisors to aid in forming a comprehensive care plan and the steps to realizing that plan. Things to be considered in this plan should be the natural and individual history of the animal, the current housing facilities, the institutional resources, as well as the animal's behavioral management foundation. Furthermore, this is a good time to make sure the details of this plan meet the needs of the animal, along with the philosophies of the institution and the AZA.

Once the husbandry and behavioral goals have been established for the animal, an area supervisor can implement the plan by fostering communication, trust, and teamwork. Supervisory roles can include: supporting and establishing cooperation amongst the animal keepers (within their section and within the animal care department) and any outside consultants (training, husbandry, and medical); directing and implementing the agreed upon care plans; and directly participating in day-to-day

working of the care plan. However, it is important the animal's keepers are given input and trust to play a major role in helping to develop and implement the programs and plans for the care of these animals. The keepers serve as the front line in terms of care and often know the individual animals better than anyone else. Although an animal keeper may be the best resource on the individual animals under their care, if they are not the institutional experts on these animals the supervisor should help in developing some general approaches for the species.

Another important role an area supervisor can play in strategies for geriatric care is through the management of resources. This can be within their area of supervision, department, and institution. One effective way this can be accomplished is to assist in acquiring the necessary equipment and tools needed for facility improvements, behavioral management, and medical care. Additional resources a supervisor might tap into are appropriate information (AZA TAGs, PMP and studbook managers, list-serves, current literature, department experts, and other outside experts) as well as the aid from other facility resources (the director, other supervisors, other keepers, behavioral manager, vet staff, volunteers, marketing, public relations, etc.). There may be specialty knowledge within the department and community that could play vital roles in the care of any animal. It is often said that it takes a village to raise a child, and the same can also be said in regard to it taking a whole facility to care for a geriatric animal. Support on all levels is essential to providing effective care and the supervisor can help direct that care.

Cooperation Within the Animal Management Department

Early on in the management of any geriatric animal, it is crucial that the individual successfully execute a repertoire of medical husbandry behaviors that allow close examination. Not only should this be possible with the animal's primary keepers, but also with unfamiliar objects and people. In order to accomplish this goal of completely generalizing behaviors to a wide variety of humans, the Oakland Zoo utilizes both volunteers and keepers from different areas. Keepers work as a unit, coming from various areas such as reptiles, birds, and ungulates. This practice builds morale and improves communication and team building amongst keepers. Additionally, aiding in the training and medical care process effectively reinforces volunteers for their time and hard work as keeper aides, enabling them to interact somewhat with the animals, and help to build a volunteer staff that commits to the zoo for many years.

Individual keepers bring diverse experiences and skills to a team. While most cross training of keepers began as part of a training plan for generalization, it has evolved into a program with multifaceted benefits where keepers work together throughout all levels of husbandry, networking and sharing ideas at every pass. This cooperation allows less experienced keepers to be mentored by more experienced keepers and those who are in the teaching role are increasing their own knowledge and skills through the tutelage of their peers. Furthermore, the entire process is reinforcing for the staff as it creates and fosters a sense of teamwork that unites the department with the common goal of enhanced animal care.

Open Lines of Communication and Cooperation with Veterinary Staff

As professionals in the animal care field, communication and cooperation are extremely important aspects of our jobs. Communication and cooperation with fellow keepers, volunteers, supervisors, animals (through training), and veterinary staff are all necessary elements in the day-to-day work that can be used to enhance overall animal care and wellness. It is essential that every keeper effectively communicates and cooperates with the veterinary staff in order to provide the best possible animal care. This teamwork approach benefits not only the animals, but also the people involved who are thus able to learn from each other's expertise.

In working together during normal training sessions, animals can become desensitized to veterinary presence and may even view it as a positive experience. When veterinary staff is involved in training for medical procedures (i.e. routine vaccinations, anesthesia induction, radiographs, etc.) animals

can receive the core components of their medical care absent of the stress caused by unconditioned procedures, medical equipment and staff. Incorporation of these elements into routine training will enhance the safety of staff and animals during the actual procedures. In the absence of veterinary staff and equipment, volunteers and props should be used to condition an animals' response to unfamiliar people and objects.

In cooperating with trained veterinary staff, keepers have the opportunity to increase their medical knowledge and experience. In addition, veterinary staff can build an understanding of the training skills that can be applied to other animals under their care. When keepers know exactly what is needed of them and the animals under their supervision for safe and effective medical care, they can utilize that information to create and implement plans for behaviors that will enable the best care possible for the animals.

Case Study: "Axel," 1.0, 17-year-old North American River Otter (*Lontra canadensis*)

Axel was born in captivity in Florida in 1991. Transferred through several institutions across the country, the otter ultimately remained at a facility in Florida for many years with a female companion. After the death of his companion, the otter was moved to a small facility in Florida where he was to be housed with two additional females. The Oakland Zoo first learned of Axel when our Director of Education sent out an e-mail to those involved in the otter management program that a small zoo in Florida was looking to place a 15-year-old male otter named Axel. He had been housed as a solitary otter after being injured during an introduction that involved severe aggression from the two females. Axel was given special attention by the keepers, but had to be housed in a small area and his keepers felt that this situation did not provide him with an ideal quality of life. Recognizing this, staff began searching for another facility with the space to offer the otter a more enriched life. The Oakland Zoo had opened a spacious and naturalistic otter exhibit two years earlier. Having just lost one of its two otters, the zoo was looking for a companion for a lone male. Axel was not only on the older side for an otter, (the longevity record for a captive otter is 23 years and many live much shorter lives), but he also had arthritis, spondylosis, and clinical signs of stomach ulcers; all of unknown duration and severity. Considering all of the factors involved, it was agreed that the Oakland Zoo possessed the resources necessary to provide an appropriate housing situation for this otter. The decision was made to move Axel to Oakland. Upon arrival in 2007, he was difficult to awaken from sleep, had an abnormally stiff gait (especially evident in the hindlimbs), and slept significantly more than the younger, eight-year-old, otter. The otter's behavior and appearance were indicative of an animal much older than 15 years. He was on three medications, all of which were to be administered twice daily; sucralfate and cimetidine for the suspected stomach ulcers, and tramadol to alleviate the pain caused by the arthritis and spondylosis.

When Axel arrived at the Oakland Zoo, training began immediately. Initially, training focused on preparing the otter to be induced into anesthesia so that a quarantine exam could be performed with as little stress to both the animal and staff as possible. In the early stages, his appetite was poor and he often left significant amounts of his diet uneaten. His poor appetite complicated training, as he wasn't entirely motivated to train; he would work for a short time and then wander through his enclosure. Despite this challenge, primary reinforcers were carefully chosen and he was trained to walk into an injection chute made of one-inch square nylon-coated mesh. A key component in this training was the incorporation of one of our veterinary technicians. It began with the technician merely standing in front of the otter's hip while he was in the chute and then progressed to her feeling for his hip muscle, and eventually poking him with a cut-off syringe. On the day of the anesthesia, he performed the chute behavior beautifully and was successfully induced into anesthesia with little or no stress for everyone involved.

Survey radiographs taken during the examination confirmed that he had moderate to severe osteoarthritis as evidenced by extra bone (osteophytes) in and around the left knee. The otter's spinal column also contained several abnormalities. The amount of space between two of the vertebrae at the end of the ribcage was decreased significantly. This condition is referred to as



Axel lateral spine & DV spine. "Decreased amount of space evident between vertebrae in the spine at the end of the ribcage, consistent with intervertebral disc disease."

IVDD (intervertebral disc disease) and is usually due to degeneration of the intervertebral disc material that cushions the vertebral bones. The decrease in cushioning may lead to pain, decreased mobility and ultimately may result in spinal cord damage. Additionally, Axel's spinal column showed moderate spondylosis at multiple locations. Spondylosis occurs in many aging animals and is suspected to be a response of the spinal column to years of wear and tear. Extra bone proliferation around the bottom of the vertebrae may help to stabilize the spine, but also may lead to pain and decreased flexibility. These results signified that Axel's behavioral repertoire would be limited, however further training was necessary for his psychological and physical well-being.

Of the behaviors in Axel's repertoire, cooperatively entering the injection chute has proven to be essential for his continued health and mobility. A few months after arriving at the Oakland Zoo, Axel began refusing

Tramadol. Keepers tried masking it in a variety of food sources, but the otter easily detected the medication and repeatedly refused the medicated food items. Veterinarians then prescribed

meloxicam, a non-steroidal anti-inflammatory drug (NSAID), which reduced the stiffness in the otter's gait and he began to exhibit an increased level of energy. Axel was able to accomplish behaviors not previously observed, such as awakening from sleep more expediently, often before keepers arrived, running throughout the exhibit, and standing upright on his hind limbs. He spent an increased quantity of time swimming in the amply-sized pools. Unfortunately, another new behavior that keepers observed was the otter pulling out fur on the left side of his body. Increasing the amount and variety of enrichment was initially tried with no significant effect. Using the injection chute, a veterinary technician was able to pluck hairs in order to test for dermatophytes (a cause of fungal skin infection), but the test was negative. The area from which the fur was being pulled continued to enlarge and the decision was made to anesthetize Axel to facilitate a more thorough examination. Numerous diagnostic tests were performed and a biopsy of the skin in the affected area indicated that Axel was exhibiting an allergic reaction to the medication. In the interval between the exam and biopsy results, meloxicam was discontinued and was followed by short courses of prednisone and diphenhydramine, both as attempts to control the inflammatory processes causing the reaction.

After attaining the results of the biopsy and observing no change in Axel's condition, a succession of several treatments were prescribed. Over the course of the next several months, Axel was prescribed ketoprofen (another NSAID), tramadol, which he again refused despite attempts to administer it in many different forms, carprofen (another NSAID), and finally ketoprofen once more. During the first couple of months, the fur on Axel's left side returned, but was accompanied by a decline in mobility and energy to the state in which it had been upon his arrival. Shortly after this was noted, the otter's left side began showing signs of thinning/fur-pulling again and after one month, Axel was, again, observed plucking the fur from his side. As the fur loss progressed, and the poor mobility continued, the use of Adequan® injections (polysulfated glycosaminoglycan, Luitpold Animal Health), an arthritis treatment commonly and successfully used in domestic animals, was discussed. Initially the Adequan® would need to be administered weekly, and then eventually, tapered to monthly injections. Keepers knew that maintaining Axel's cooperation in the training process would be essential for the success of this treatment.

Preparations and planning for the training process were made before the treatments began and were continued for the duration of the injections. In order to tailor the shaping of the behavior and ensure success, keepers discussed with the veterinary technician the exact location for the injection and how Axel could be better positioned within the chute. Part of the difficulty in giving Axel injections was that his arthritis and spondylosis had caused the hip muscle into which the Adequan® needed to be injected to deteriorate to the point where it was difficult for the veterinary technicians to feel the muscle and locate an injection site. This meant that Axel had to be additionally desensitized to vigorous contact at the proposed injection site and that this would have to be done prior to each injection. Major parts of maintaining the behavior included heavily and continuously reinforcing the otter while he was in the chute, using a second person to play the role of veterinary technician in each session to further condition the otter and generalize the behavior to multiple people. There were some minor difficulties during the initial treatment period but, with the guidance and coaching of their supervisor, keepers and veterinary technicians were able to successfully administer injections weekly for six doses, every other week for five doses, and then approximately every four weeks until the writing of this paper, which, currently, is three doses.

At this time, Axel is only being given cimetidine orally and is receiving Adequan injections approximately once every four weeks. He is running, pulling himself up onto high rocks, logs, and other exhibit furnishings, and is awake and frolicking in the exhibit when keepers arrive in the mornings. His appetite has vastly improved and he has gained a significant and healthy amount of weight. He is motivated to train each morning and readily tears into his enrichment. Most recently, he has even been seeking out enrichment and training activities, something that was rarely seen when he first arrived. Through



Axel participates in injection chute training.

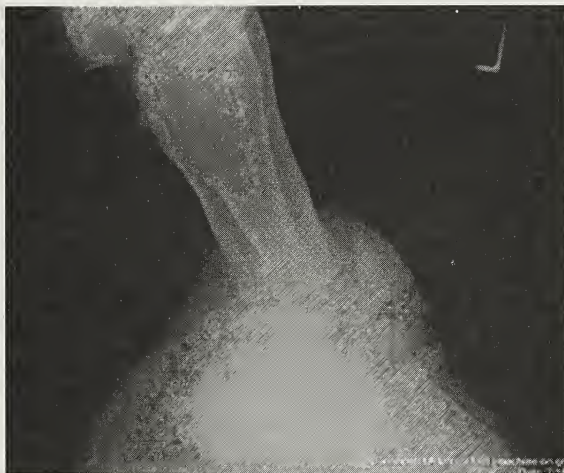
the careful planning and care given by keepers, supervisors, and veterinary staff and due to the zoo's spacious and naturalistic otter habitat, we believe that Axel's life has not only been improved but has been extended. The keeper who advocated the transfer to the Oakland Zoo considers the improvement to Axel's overall wellness to be one of the greatest successes and most rewarding experiences of his career.

Case Study: "Tiki," 0.1, 20-year-old Reticulated Giraffe (*Giraffa camelopardalis reticulata*)

The average captive life expectancy for a giraffe is approximately 25 years. The age at which a giraffe is considered "geriatric" depends upon several factors and is affected by genetics, the environment, diet and nutrition, and the overall husbandry and daily care of the animal. For "Tiki," 0.1, 20-year-old, reticulated giraffe at the Oakland Zoo, the geriatric condition began with the onset of a degenerative, potentially age related medical condition. In early 2001 Tiki presented with a shortened, shuffling gait. Initially there was no localized lameness, but an observable stiffness through the forequarters. As the abnormal gait persisted, keepers trained the giraffe for voluntary radiographs of the forefeet, enabling veterinarians to diagnose the giraffe with ringbone, a condition commonly seen in the forelimbs of mature domestic horses. Ringbone is an osteoarthritis condition of the interphalangeal joints, involving the formation of osteophytes (extra bone). This condition is painful and causes clinical signs of lameness, joint enlargement, and joint dysfunction. Tiki was diagnosed with severe low ringbone and moderate high ringbone in both the left and right forefeet.

In Tiki's case, the radiographs revealed osteophytes surrounding the coffin joint, and this new bone development appeared to be the cause of the moderate lameness. As the low ringbone advanced, it caused a visible bony swelling above the coronary band, and varying amounts of lameness from subtle to almost non-weight bearing on the affected leg. In Tiki's case, the moderate high ringbone involved only mild swelling along the ventral surface of the pastern, closest to the coronary band. As the osteoarthritis in the forefeet advanced, additional radiographs showed the development of sidebone, a condition involving the calcification of the lateral cartilages of the pedal bone.

The discomfort resulting from the ringbone and sidebone caused an abnormal stance where Tiki shifted her weight backwards onto the heels of the forefeet, leading to tension in the musculature of the withers, shoulders, chest, forearms, and elbows. In the hindquarters, the majority of her weight was borne on the medial claws, with the rear legs wide set, putting excessive strain on the hocks. Over time this caused deformity in both claws. The medial claws began to narrow and roll under and the lateral claws grew unusually long and in a splayed fashion due to a lack of wear on the lateral, weight-bearing surface. The muscle and joint pain accompanying this unusual stance lead to an overall reduction in movement, producing a deficiency in hoof wear, and a lack of muscular fitness.



A large amount of "fluffy" bone proliferation is evident around the joints in the pastern, diagnostic of ringbone.

The advancing ringbone disease process could not be halted, however the literature relating to ringbone in equids suggested that certain treatments could make the giraffe more comfortable and potentially slow progression. Keepers worked with veterinarians to create a management plan with both short- and long-term goals designed to meet evolving husbandry and medical needs. The overall goal of this management plan was to first relieve the giraffe's pain and then work to slow the progression of the ringbone by reducing the mechanical aspects that contribute to the disease. Traditional and common treatments for ringbone cases in horses were initially explored including drug therapy (non-steroidal anti-inflammatory drugs and glycosaminoglycans), cold pack (ice) therapy, stall rest, fusion of the pastern, and corrective hoof trimming. In an attempt to reduce localized inflammation in the feet, preliminary treatments involved the use of different oral NSAIDs (phenylbutazone and flunixin meglumine) and cold therapy. Oral NSAIDs appear to have a limited effect on the giraffe's condition. They reduce the palpable heat felt on the pastern and hoof, but only have a small degree of impact in reducing the overall lameness. The NSAIDs appear to have a more noticeable effect when lameness is mild, seeming to reduce the level of observable favoring of a particular limb. When the level of lameness is severe, the drugs appear to have little effect on the giraffe's mobility. Topical creams aimed at reducing inflammation in the feet are also used. Diclofenac sodium cream and menthol creams produced for horses are used with limited success. These visibly reduce swelling and effectively reduce the heat in Tiki's lower extremities when applied beneath a wrap and left in place for 60-90 minutes, but when used without a leg wrap, they demonstrate a minor effect. Surgical fusion of the pastern was not a feasible option for Tiki as she was not a young animal and the majority of her pain was due to the low ringbone, not the high. It was determined that a long-term, non-surgical treatment plan would be most effective in this individual case.

Cold therapy was initially attempted using bags of ice cubes, frozen vegetables, or first aid ice packs designed for humans. Keepers taught the giraffe to station in a specified location and remain

still while allowing the application of the ice and leg wraps which was minimally effective, as it did not enable movement, requiring Tiki to stand in place for an extended period of time in order to see any anti-inflammatory effects. The icing methods lacked flexibility and were difficult to attach to the giraffe's leg with a wrap as the ice packs had a tendency to slide down during movement. Additionally, in hot summer environments, the packs only remained cold for approximately 30 minutes.

All additional treatments considered in the long-term management plan required advanced behavior management and an operant training program. The core training and behavior modification strategy for the Oakland Zoo relies on the science of Applied Behavior Analysis. All giraffes are systematically conditioned to have a positive emotional response to keepers achieved through classical and operant conditioning protocols. The entire collection is taught basic movement behaviors to facilitate efficient management and ensure that they can be transferred between stalls or yards without the use of herding methods. Tiki has core baseline behaviors taught by shaping cue-based movement for "move up" (the giraffe takes one step in a forward direction), "back up" (the giraffe takes one step in the backward direction), and "move in" (the giraffe moves either a specific shoulder or hip to touch a stationary target). Giraffes are also taught "steady," (remain still with all four feet planted on the ground), name recognition (come when called), conditioned to allow handling of legs and feet, and conditioned to hand targeting to allow head and face examinations.

With advanced training protocols underway, additional therapies became realistic possibilities for Tiki. Keepers researched alternative icing methods within the equine industry and located a set of leg wraps and boots with mesh pockets inside that encase ice packs. The ice packs are filled with a patented gel material, making them both soft and flexible, and even in outdoor temperatures exceeding 90°F [32.3°C] they remain cold for up to three hours. Keepers trained Tiki to wear the boots and leg wraps, enabling reduction of the inflammation in Tiki's forefeet safely and efficiently by icing for extended periods of time, while allowing Tiki to move and walk freely for the period of time the procedure requires.

While traditional equine therapies were used with some success, additional alternative treatment modalities were identified for the long-term management of the giraffe's disease. The treatments would require the services of individuals outside of the zoo who had specialized expertise and skills. Keepers looked within the local equine and small animal communities to assemble a team of experts with specialized training in acupuncture, chiropractic care, natural balance farriery, and a certified training consultant, and brought these practitioners and veterinarians together to form the Tiki Care Team. Unique to the Tiki Care Team is that all expert participants donate their time, skills, and specialized products. In order to allow non-zoo staff to work in close contact with the giraffe while remaining within the constraints of protected contact, the holding area used for treatment was modified to allow access to Tiki without reducing standard safety protocols.

Since ringbone is a progressive problem that causes pain in the lower extremities and an abnormal compensatory gait, the natural wear on the hooves tends to be insufficient and lacks overall uniformity. Therapeutic trimming plays an important role in maintaining soundness and slowing the disease's progression. The overall lack of wear from reduced walking, pushed Tiki's weight back onto the heels of the forefeet, leading to a poor hoof-pastern axis, quarter cracks, outer hoof wall flare, etc. With weekly trims, her hooves are maintained for ideal shape and proper breakover. The correct breakover angle decreases the strain on her joints and the soft tissue in her lower forelimbs. Strict attention to foot care, with a natural balance farrier, has been an instrumental part of keeping Tiki sound and moving freely. In order to accomplish therapeutic hoof care Tiki was taught to lift the specified hoof off the ground following a physical cue. Borrowing directly from the equine world, the desired leg is lifted after the keeper gives a gentle squeeze to the medial side of the fetlock joint (rear leg), the medial side of the cannon bone (front leg is lifted and folded under, with heel bulbs pointing toward abdomen), or the dorsal side of the carpus (front leg is lifted and extended forward). The foot lifting behaviors are shaped so that the giraffe supports all of her own weight and simply

shifts her balance to stand on three legs. The lifted leg remains relaxed and keepers can manipulate the exact position for safe and accurate trimming. A modified equine hoof stand is often used to facilitate corrective hoof management.

The direct benefits of these trimming procedures have been evident in multiple instances of decreased lameness and more uniform weight distribution among the four feet following hoof trims. As a result of Tiki's improvement, keepers are now planning and training for the future with additional individuals in the ungulate collection. Extensive training for hoof care is now part of the husbandry protocols for several species including the giraffes and common eland (*Tragelaphus oryx*). This is a cooperative procedure in which the animal management staff works closely with the veterinary staff, with veterinary technicians and veterinarians routinely participating in training sessions.

Several different types of alternative and holistic treatment modalities are used with varying degrees of efficacy to treat horses with ringbone. While alternative treatments do serve an important role in Tiki's long-term management plan, they are used in complement to (and never in place of) traditional Western medicine, and only under the full supervision of the Oakland Zoo's veterinary staff. One of these alternative modalities, acupuncture, is an integral part of Tiki's pain management plan. Acupuncture uses thin needles to stimulate specific points on the body with the goal of achieving therapeutic effects. A veterinary acupuncturist works with keepers and veterinarians to administer monthly acupuncture treatments where Tiki holds a "steady" position for the insertion of the acupuncture needles into specific points along her shoulders, forelegs, and feet. Additionally, the veterinary acupuncturist often injects small amounts of homeopathic remedies or vitamin B-12 into the shoulder muscles where the giraffe experiences muscular tension and palpable tightness. Post-treatment, keepers have consistently observed a marked improvement in the flexion and extension of the forelegs as well as a reduction in palpable tightness and firmness of the tissue through the musculature of the shoulders.

A natural complement to acupuncture, chiropractic care is a form of physical therapy often indicated as potentially effective in treating muscle and nerve pain associated with ringbone in sports performance horses. A chiropractor with extensive equine experience was brought in to ease the back and shoulder pain associated with Tiki's compensatory gait. The abnormal stance often causes Tiki to pull her head and neck back toward her pelvis, leading to tension and occasional muscle spasm throughout her withers and an abnormal sway at the mid-point of her spine. Keepers train Tiki to allow for a wide range of physical palpations, touching her entire body with different hand positions and a varying degree of pressure, as well as manipulating her body with different grooming and massage tools. She is asked to stand in a "steady" for chiropractic adjustments. Standing on a ladder, the chiropractor adjusts the affected areas of Tiki's spine by carefully motioning the joint in a specific direction, so as to return the joint to normal motion and alleviate any muscle spasms. Post adjustment, keepers have observed a reduction in tenderness at the mid-point of her back, and an elongation of the gait in the front end. Chiropractic care is a monthly treatment as keepers feel it is effective in increasing her range of motion and reducing muscle tenderness and spasm. As an added benefit to the zoo collection, the chiropractor's services have also been extended to several other members of the giraffe herd, the camels (*Camelus sp.*), and domestic livestock in the petting zoo. As the collection ages, training for chiropractic care has become part of the long-term husbandry plan for many animals.

Massage therapy is a common treatment for equine athletes suffering from ringbone. Potential benefits include enhancement of muscle tone and range of motion, reduction in localized edema, stimulating circulation, and the release of endorphins. The training for chiropractic adjustments prepared Tiki well for massage therapy. Keepers use the "steady" behavior to hold her in position and the certified equine bodyworker who performs the massage gains access to her body using step stools and ladders. Tiki often leans into the touch and pressure of the massage therapist's hands. She appears to relax during the massage, exhibiting a very relaxed body posture with low, soft eyelids, and a slowed rate of respiration. Keepers feel that the bi-weekly massage is a successful

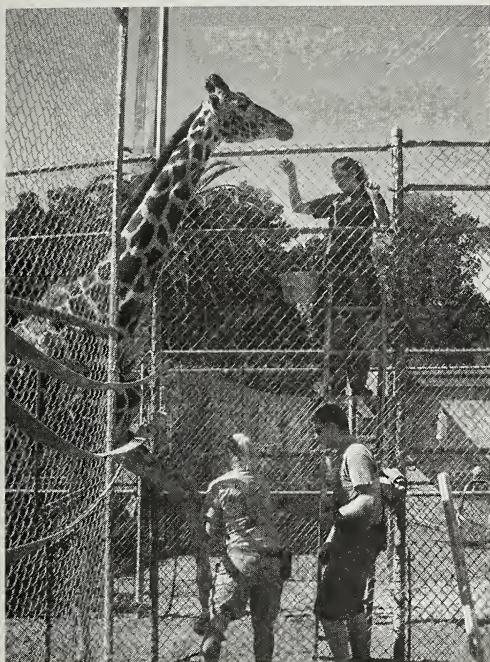
treatment for relieving the tenderness and palpable excessive firmness, as well as bogginess and localized edema throughout the musculature of the giraffe's withers, shoulders, and chest. Massage services have also been extended to those individuals in need among the domestic livestock and zebras (*Equus sp.*).

Stretching exercises are commonly used as a form of physical therapy in geriatric horses to help the muscles, tendons, and ligaments maintain elasticity. It is used as part of Tiki's management plan with the goal of helping her muscles to retain a certain level of flexibility and overall fitness, thereby reducing the risk of strains or pulls. Keepers train the giraffe to offer each of the front legs when given the physical cue, a gentle tap to the dorsal side of the carpus. The behavior is shaped so that the leg can be extended out in front of her to stretch the shoulder, withers, and elbow. Alternatively, the leg can also be folded under so the heel bulbs come up toward the abdomen, gently stretching the tendons and ligaments surrounding the carpus. Keepers have found that stretching Tiki for five to seven minutes, three days per week significantly reduces instances of lameness and helps her to maintain a more flexible, elongated stride.

As Tiki moves less than the typical giraffe her age, her muscles lack an overall level of fitness, and it is conjectured that as a result she is particularly sensitive to cold temperatures. In colder weather Tiki's gait often appears more stiff than usual and she is often observed shivering when the temperature falls below 55°F [12.78°C]. While she is always given free access to indoor, heated space, standing predominantly stationary inside for the duration of the day is not an ideal management situation for hoof health as it allows moisture and soiled bedding material to pack into the soles of the feet, leaving the animal susceptible to fungal infection. While sufficient stall rest is important, extended periods of stall rest are counter productive as the lack of movement contributes to a reduction in circulation to the lower extremities. In the past, on colder days, Tiki would elect to remain indoors and would not shift with the herd. Keepers would then spend the duration of the winter months treating thrush in her feet. The Sierra Horwear Company worked with keepers to design a "giraffe shaped coat" with special safety features. The custom blanket is fastened using adjustable, velcro straps for quick release should the blanket get caught on something. When the outdoor temperature indicates that it is necessary, keepers outfit Tiki with the appropriate blanket (light weight or heavy weight), enabling her to stay with the herd if she so chooses, and preventing her from remaining stationary for an extended period of time.

A strong indicator that the above-mentioned alternative therapies seem to be effective is Tiki's willingness to participate in the treatments. Tiki is not held in a chute or confined beyond the freedom of a holding yard during treatments. Treatments are administered along a chain link fence line (where access hatches have been cut into the fencing) and through a cable barrier. She has free choice to walk away from the training session at any time, but chooses to remain engaged in the process. As practitioners approach the giraffe holding yards to administer treatment, Tiki often positions herself without being cued for the behavior, lining up against the barrier and waits for treatment. She often positions herself for stretching and offers her leg for stretching when there is no food reinforcement present (referred to as "mand" or manding in B. F. Skinner's Verbal Behavior, which means to request reinforcement. The stretching process is the reinforcement for the leg lifting behavior). Keepers believe these behaviors are strong indicators that the treatment may have the desired effects on Tiki's physical ailments, and may also indicate that the training and the interaction involved in these treatments are excellent cognitive enrichment, enhancing her quality of life on both physical and psychological levels.

Tiki's training will continue to evolve, as the treatment and care needs parallel the evolution of the disease process. Many new behaviors are trained in anticipation of potential future therapies. Keepers train for voluntary hand injections and cooperative jugular blood draws in the event that steroid therapy or the use of disease modifying osteoarthritis drugs (glycosaminoglycans such as Adequan® and Legend®) becomes necessary. Tiki is also trained to execute a variety of body targeting behaviors (targeting her carpi, chest, nose, neck, feet, hips, and shoulders), enabling keepers to exercise her in the event of long-term stall rest requires an exercise program in a small indoor space. Planning for the future is the key to success with a case as potentially debilitating as this one. Reliable, well-trained behaviors are the foundation for more invasive therapies: acupuncture, chiropractic adjustments, massage, or intensive hoof trimming, required extensive shaping to expand her repertoire of learned behaviors.



Keepers stretch Tiki as part of her physical therapy program.

In order to condition and train for these therapies, keepers brought in volunteer certified training consultant, Lisa Clifton-Bumpass. The training consultant mentors keepers in developing training goals, record keeping systems, and the complex practical skills needed to train for these difficult medical husbandry behaviors. Prior to the addition of the training consultant the giraffes were always trained with two people, one to deliver the reinforcement at the animal's head level and one to work the behaviors. With an additional person now part of the training picture, the team training system was expanded so that there is now a coach/observer. Volunteer

staff is utilized as the person delivering the reinforcement, and additional staff members are brought in from other areas within the animal management and veterinary departments to help generalize these behaviors to multiple people at an early stage. It is crucial that Tiki not only successfully complete behaviors for her primary keepers, but also for unfamiliar veterinarians, practitioners and equipment. This training process creates a synergistic system that brings together keepers from different areas in the zoo, building and improving communication, skill and problem solving for the personnel involved in the

process. Additionally, by including volunteers in the training process, they are reinforced for their time and hard work as keeper aides, by enabling them to interact with the animals by protected contact, and helps to build a core volunteer staff that remains committed to the zoo over time.

Conclusion

Due to constantly improving and evolving husbandry, training, and veterinary practices, the life expectancy of many captive animals is far exceeding that of their wild counterparts. The geriatric stage of life presents itself at different times and in various forms depending on the natural and individual history of each animal. Planning for future life-stages as if they were now is an essential strategy in improving and prolonging an animal's life. Fostering cooperation and communication among keepers, veterinary staff, and supervisors supports this common goal and facilitates its realization. In this synergistic process, the whole, created by the cooperation among all staff involved in an animal's care, is greater than the sum of the individual contributions. In the two examples set forth, multiple and diverse modalities are successfully used to improve the care and prolong the lives of these animals. These case studies, and the ideas expressed within them, can be tailored to fit a wide array of species independent of size, facility specifications, protected or free contact management styles, and the animal's life-stage. Although the animals in our care may not all currently be in the geriatric phase of life, having management practices in place that prepare them for these future years at the present time, enables us to expediently and effectively treat these ailments as they arise during the aging process.

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(All photos courtesy of the Oakland Zoo)

Some Thoughts on Veterinary Considerations on the Management of the Geriatric Zoological Patient

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Management of the geriatric zoological patient is one area of medicine which calls for the closest collaboration between the animal keepers and the attending veterinarian. Geriatric patients have always been a consideration in zoological medicine. However, because zoo collections underwent rapid expansion in the 1980's and early 1990's, the numbers of geriatric patients seen by zoo veterinarians has recently grown. Likewise, veterinary medicine has progressed during that period of time as well, so the medical options for management of chronic, aged patients have multiplied. The animal keepers' observations and advice are essential to allow the attending veterinarians and curators to make appropriate decisions about when to initiate therapy, how it is to be maintained, and when declining quality of life makes euthanasia the most humane choice.

Most age-related problems develop slowly and insidiously, and it is often incumbent on the caregivers who know the animals best to make the subtle observations necessary to inform the veterinary staff when a geriatric animal is beginning to have medical problems. Small changes in behavior, attitude, appetite, and mobility often are the first clues to a serious problem, whether it is degenerative joint disease, spondylosis deformans, congestive heart failure, chronic kidney failure, neoplasia, or diabetes. Once the diagnosis of the problem has been made by the veterinary staff, the next duty of the veterinarian is to offer a prognosis. Is the problem fixable, or is it something one can only manage as a chronic problem? If so, what are the resources necessary to handle such a problem, and can it be done so safely and humanely? Indeed, if the prognosis is grim, the actual diagnosis may be of only academic interest, because a negative outcome may be unavoidable.

Veterinary medicine, like human medicine, has become so large and so complex that, for most any disease or disorder, one can almost always think of something else one could try. However, just because there is another drug, another test, or another surgical procedure that could be performed, it doesn't mean that it should be performed. Often, because the diagnosis is firm, and the final outcome is not in doubt, it is inappropriate to keep subjecting an animal to additional immobilizations, blood samplings, or treatments when all it has to look forward to is more days of poor health. In these situations, the advice of the animal keeper with respect to the animal's quality of life is invaluable. Often it is very difficult for a veterinarian or other manager to get the full picture of the animal's behavioral condition because we cannot be there as often as the regular keeper staff, and because the animals often (perhaps usually!) do not behave normally in our presence. These observations may be basic: Is the animal able to eat and drink adequately on its own? Will it shift? Can it adequately groom itself? But indications of declining health may also be subtle, such as noticing diminished vision, mild lack of coordination, diminished cognitive ability, or inability to interact well with conspecifics.

Often the success or failure of any treatment plan hinges on the efforts of the animal keeper and their relationship with the animal. If the animal needs daily MSM/glucosamine supplements and/or NSAIDS for arthritis, it is up to the animal keeper to find a creative way to get the animal to regularly consume the medication. This may be easy if it is a food-motivated animal like a bear or a primate, but may be more challenging if it's a finicky carnivore, or if the animal is on a restricted diet (such as a diabetic primate who cannot be given sweet, sugary treats to disguise a medication).

Another example is a diabetic primate that may need multiple daily blood samplings to check blood glucose levels and once or twice daily injections of insulin. It is entirely due to the skill and diligence

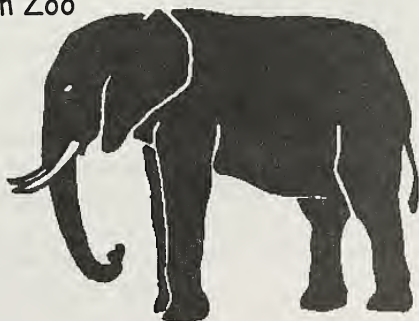
of the animal keeper to train it to accept the injections and lancet sticks as well as to maintain the behaviors. This is much more time and effort on the part of the keeper than for the veterinarian! We have one such case at Cleveland Metroparks Zoo right now, and the success of the training program is extraordinarily impressive. Similarly, for animals on chronic medication, effectiveness of treatment can best be evaluated on the basis of information obtained by the animal keeper, not only with respect to whether the animal is showing positive effects from the medication, but also whether the animal is suffering any side effects of the medication. Every medication, no matter how safe or effective, has both effects and side effects. Although they do not show up in every case, it is important for keepers to be vigilant about noticing side effects such as stupor, diminished food intake, changes in urine or feces, tremors, disorientation, or even that the animal is just not "being itself."

Perhaps most importantly are the keeper's observations about when the appropriate therapy is no longer giving the desired result. Often, despite long and dedicated treatment, it will become apparent that an animal's condition is regressing despite being on the strongest drugs at the best therapeutic dosages. This is especially true for the chronic arthritis cases, the chronic renal failure cases, congestive heart failure cases, and cancer cases. Almost always, when an animal keeper approaches me and reports that a case of chronic illness is doing worse and the keeper believes that it is time for euthanasia, they are right. Unless the veterinarian has a stronger or more effective medication to offer, at that point euthanasia is the best option. This avoids allowing the management of a geriatric case to become an intellectual exercise that keeps the animal alive beyond the point of quality of life. At those times we must put the welfare of the individual patient ahead of our personal desire to keep trying.

The management of the geriatric patient is challenging, interesting, and rewarding. It calls for close coordination between veterinarians and animal keepers, and is an excellent example of how the skill and determination of professional animal keepers can make the difference in development and implementation of a good management plan for the animal in its twilight years.

Pachyderm Milestones

- Peaches, a female African elephant at the Lincoln Park Zoo in Chicago, IL died in January of 2005 at the age of 55
- Kali, a female Asian elephant at Utah's Hogle Zoo, Salt Lake City, UT, died in March of 2004 at the age of 59
- Petal, a female African elephant at the Philadelphia Zoo died in June 2008 at the age of 55.
- Asian elephant Susie of the Birmingham Zoo died at age 55 in February of 2005
- Ambika, a female Asian elephant at Smithsonian's National Zoological Park in Washington, DC, is estimated to be about 60 years old. She came to the National Zoo in 1961 and lives there still.



The Oldest of the Old

By Lindsay Cosens, Zookeeper – Birds; Marilyn Crowley, Enrichment and Research Technician – Mammals; Rebecca Johnson, Associate Curator of Amphibians; Mary Wulff, Enrichment and Research Technician – Mammals: Detroit Zoological Society, Royal Oak, Michigan

When the *Animal Keepers' Forum* put forth a call for papers to be featured in an issue dedicated to the concerns of caring for geriatric specimens, many of the keepers at the Detroit Zoo began mulling over what seemed to be an endless array of options to submit for publication. Like most zoological institutions as of late, the Detroit Zoo is home to an ever-increasing number of aging residents. We decided that it would be a good plan to condense and compile some of the issues and concerns that are part of everyday life here in Detroit and put forth a collaborative effort. We requested a listing from the zoo's registrar so that we could have some official documentation of the lifespans and histories of some of the oldest animals here. We had hoped to pin down a good variety of individuals so that a broad spectrum of issues could be addressed. But we got much more than we bargained for, and very quickly had to turn an about-face to try and put some limitations on the scope of this article.

The Registrar's list included birds, amphibians, reptiles and mammals. It included animals still living and those recently deceased. It included a great number of animals that have or had lived many years beyond average life expectancy. And it was by no means an exhaustive list. It turns out that in Detroit, we even have geriatric tortises. We quickly realized that the only way to seriously limit our scope would be to focus on a few very remarkable individuals representing an elite group of the oldest of their kind.

Penguins



King 1 ("Mr. Man"), 2009

(Photo by Lindsay Cosens)

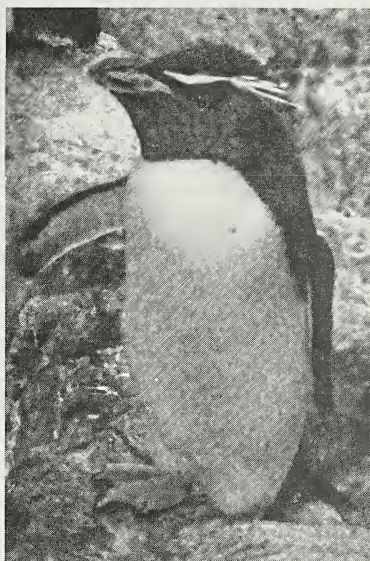
Opened in 1968, the Penguinarium at the Detroit Zoo was the first exhibit in North America designed specifically to house penguins. The facility currently houses two of the country's oldest living penguins. King One [*Aptenodytes patagonicus*], also known as "Mr. Man," is over 41 years old. Collected from the wild as an adult, he has been at the Penguinarium since the building opened. Age has brought him cataracts, a slow walk, and poor preening skills. Although he avoids the pool, King One still pairs up for breeding season and provides fertile eggs. The other notable penguin is a 37-year-old Rockhopper [*Eudyptes chrysocome*] toting a yellow left ankle band, referred to as R-L Yellow. Born at the Detroit Zoo in 1972, this female was the first Rockhopper to successfully hatch in captivity. She, too, has cataracts and an awkward gait.

Of the 66 penguins at the Detroit Zoo, 36 individuals are aged 20 years or older. With an average lifespan of 15 to 20 years, this is a significantly geriatric population. The most common ailments occurring in the flock are arthritis, cataracts and pododermatitis (bumblefoot). With the assistance of the veterinary staff, effective treatments have been developed to manage these problems. Annual physical exams are performed to track the progress of each penguin's health. Changes in foot and body condition are noted and the necessary medical treatments are determined.

To manage arthritic penguins in the flock, a daily supplement of Glyco-Flex® (Glucosamine) is prescribed when a bird has developed an obvious change in its gait and/or exhibits deteriorated mobility. A physical

examination and radiographs are often performed to rule out any possible other underlying causes for limping, such as broken bones or fractures. Pain medications, such as Meloxicam, are also periodically prescribed to ease any discomfort caused by bouts of severe arthritis.

Cataracts also frequently develop in captive penguins, causing impaired vision and eventually changes in behavior. Severe cataracts tend to impede the effectiveness of the indoor exhibit's light cycle, and can ultimately affect important behaviors such as molting. Not much can be done to prevent the development of cataracts. Severe cases are noted when a penguin is examined during its annual physical, and those individuals are placed on a list to be checked monthly by a visiting ophthalmologist. Uveitis and irritation caused by cataracts are managed through the daily use of medicated eye drops when needed. In 2006, a visiting ophthalmologist suggested cataract removal for four of the Penguinarium's current residents. Two Macaronis [*Eudytes chrysolophus*] and two Rockhoppers made their way to the specialist's off-site facility. Each underwent a single cataract removal to help improve its vision. The procedure appears to have worked for these individuals, but due to its risk and potential complications, future surgeries of this kind are not likely.



RL Yellow, 2009
(Photo by Lindsey Cosens)

Penguins of advanced age, along with many other species of birds, also commonly suffer from foot problems. Several environmental factors such as decreased activity and prolonged standing on hard surfaces may lead to pododermatitis or bumblefoot, which is a bacterial infection resulting in the formation of a lesion on the bottom of the foot. This disease creates damage to the tissue, potentially resulting in secondary bacterial infections. Swelling of the soft tissue and scab formation may cause discomfort to the individual, which further prohibits mobility. Several treatments have been utilized in Detroit's flock. Daily foot care includes thorough cleaning of the lesion with a Nolvasan® solution and application of a cream, such as Protecta-pad®. This helps avert the entry of additional bacteria by softening the tissue and preventing a core (a tissue "plug" in the center of the lesion) from falling out. In one severe case, a 24-year-old Macaroni female has also undergone surgical debridement, bandaging of the area, and has even worn booties made from wet suit material and Velcro® to help cushion her step.

Advances in veterinary medicine have made significant contributions to the husbandry of penguins. Good teamwork between the animal care personnel and veterinary staff at the Detroit Zoo has provided long, healthy lives for many of the penguins at the institution. King One and R-LYellow are living proof of these accomplishments.

Ajax

At 26 years old, Ajax is the oldest male giraffe in North America. He has poor conformation and chronic arthritis. Ajax's advancing age exacerbates an already timid personality and Ajax has undergone extensive desensitization therapy to ensure the delivery of daily medications. Ajax is treated daily with Cosequin® and with closely monitored and continually adjusted doses of Tramadol and Phenylbutazone to alleviate pain and inflammation. Unfortunately, these treatments have the undesirable effect of making Ajax more mellow and less active, so it has also become very important to get him moving in order to keep his joints flexible. We use daily enrichment and training sessions to encourage Ajax to move and utilize all the available space in his enclosure.

Climate conditions in Michigan mean that Ajax spends the duration of the winter months indoors. Throughout the winter season, his keepers schedule daily target training sessions to get Ajax walking around. One-inch thick black rubber mats have also been added to the holding area floor to reduce the pressure on his joints. These seem to help as, given the option, Ajax usually chooses to stand on the mats. Specific placement of enrichment and food items also allows staff to encourage a natural stance. For example, alfalfa is fed from a hanging basket and pellet food is presented in raised food dishes. When conditions allow for access to the outdoor yard, Ajax's keepers hang various types of enrichment around the exhibit at different times during the day in combination with training and physical therapy sessions to encourage as much movement as possible.

The Detroit Zoo recently acquired a young male, one-year-old Jabari, and we have spent the last several months introducing him to Ajax and the other giraffes in the exhibit. Adding Jabari to the mix has also been great for Ajax. The daily interaction between these two males initiates a lot of movement from Ajax and increases species-specific interactions. Since the addition of Jabari to the group, staff has even witnessed Ajax bring himself to a gallop, something that does not occur very often.

Photo and video documentation have aided keepers and veterinary staff in documenting the progression of Ajax's condition. Since we can't observe Ajax 24 hours each day, video cameras were recently installed in his exhibit to monitor his movement. These cameras are integrated to a web site so that round the clock observation is now possible. A video record is created which can be reviewed at staff's convenience. Keeping a daily journal and detailed documentation of Ajax's behavior is critical to daily husbandry care and management of our elderly treasure and the close monitoring and evaluation of Ajax's quality of life.



Ajax, 2006
(Photo by Tom Roy)

Rudy [*Diceros bicornis*]

Rudy, our black rhinoceros was wild-caught in 1952. We lost him December of 2001, making him the oldest known rhino in captivity. Rudy enjoyed good health throughout his adult life, but nevertheless we dealt with a number of age-related issues. Pressure sores on his hips, from increasing periods of time spent lying down were an ongoing concern. Black rhinos are prone to pressure sores due to poor circulation as they age. These were treated topically and systemically with silver sulfadiazine and Uniprim[®] to prevent infection and with fly repellent in the summer months to prevent infestation. A and D Ointment[®] was also applied in winter months to prevent further cracking or chafing. Rudy was trained to stand and lean-in at a protective contact barrier for these treatments. These interactive sessions also had the added benefit of keeping Rudy engaged, enriched, and active.

Always slim, keeping weight on him as he aged also became a problem. Sweet feed was added to his normal diet of monogastric pellets (horse feed) but that was met with limited success. So, we switched his base diet to a specially formulated Senior Equine pellet. He took readily to this new feed as it was easy for him to chew and he soon returned to a healthy body condition.

As with the majority of geriatric creatures, arthritis became our biggest challenge with Rudy. We dealt with this on a daily basis and attacked on every front. A hot water heater was installed in his holding area and he enjoyed warm, sudsy showers. Special mats were ordered for his bed, which resembled air mattresses but were filled with shredded rubber rather than air. These were layered with additional standard black mats to cushion the concrete floor. Occasional treatment with



Rudy, 2001

(Photo by Tom Roy)

phenylbutazone developed into an everyday addition to his routine with the dosage adjusted according to his needs. Panera[®] raisin bread was the key component to ensuring his cooperation with the medication process.

The most important factor in maintaining Rudy's level of comfort was the overwhelming affection his keepers felt for him. Anyone involved in the care and management of an older animal understands the special bond that develops. No treatment, be it topical, oral, medical or therapeutic can be administered with any success to an animal of Rudy's size without the benefit of a trusting bond. Rudy remained engaged and active until the end. He was a zoo favorite and we miss him still.

Adak [*Ursus maritimus*]

Adak was our 29-year-old, neutered male polar bear. Adak was captive born in Portland, Oregon and moved to Detroit via the Sacramento Zoo in March of 2000. Aside from some apparent stiffness on the dreariest of days, Adak, like Rudy, remained amazingly healthy until very near the end of his life. Adak received a daily supplement of Cosequin[®] to assist with joint fluidity, but otherwise required very little special attention.

Adak became a daily companion for our (then) three-year-old female Talini. Talini was born at the zoo and raised by her mother. But upon the re-introduction of her mother to a breeding male, she was strongly rejected by her mother post-breeding season and could not be re-integrated into a social group with any bear other than Adak.

One of the few age-related considerations that we made for Adak was whether or not to permit the continual assault from his always-ready-for-action companion. But Adak managed to deal with Talini quite well on his own, letting her know when he'd had enough, and we rarely actively separated them other than for routine feeding. Adak was an extremely easy-going male bear and readily accepted, even relished, his May-December relationship with Talini. We all truly believed that Talini actually played an important role in keeping Adak young. Just days before the heart wrenching decision was made to euthanize Adak, he and Talini spent a good hour and a half rough-housing in their pool. Still, there were occasionally days when Adak would decide he would rather just hang out in the air conditioning by himself and take a nap. And if that was what Adak decided, that is what we would have Adak do.

In the fall of 2007, Adak developed acute cardio-pulmonary edema indicative of congestive heart failure. He was immobilized, radiographed and given a cardiac ultrasound to confirm this diagnosis. His prognosis was grave. He underwent an aggressive treatment with diuretics and with the onset of cold, dry weather, improved almost miraculously. He spent the last two or three months of his life surprisingly active and in apparent good spirits. But in January 2008 we experienced an unseasonably warm spell for Michigan, and virtually overnight Adak's health took a catastrophic turn for the worse.

Adak's situation reminded us that the greatest defining factor in the life of a wild animal is its natural environment. That all our efforts to provide a close approximation to that environment can

turn against us in a flash, because in nature, it is most often that very factor that challenges and cuts short the lives of wild creatures.

In the end, Adak suffered—thankfully, only briefly. Understanding his cooperative nature and knowing his normal patterns of behavior provided us with instant warning that things were not going well. Adak's suddenly stubborn demeanor preceded the onset of obvious physical distress and made his pain terribly evident. A decision had to be faced quickly. Another round of aggressive treatment may have prolonged his life, may have even alleviated his symptoms for a period of time. But spring, thunderstorms and oppressive humidity are inevitable in Michigan. And it was obvious that no course of treatment would alleviate the imminent complications that would be brought on by such factors. We sadly made the decision not to risk prolonging his discomfort and said goodbye to Adak, the oldest male polar bear, in January of 2008.



Adak, 2006

(Photo by Betsie Meister)

Mississippi Gopher Frogs [*Rana capito sevosa*]

It is not that difficult to relate to the considerations of advanced aging faced by large mammals and charismatic birds such as penguins. But these considerations extend to all animals in our care. The Detroit Zoo is currently facing a unique situation regarding a small population of geriatric frogs. Mississippi gopher frogs are one of North America's most endangered amphibians. The Detroit Zoo received 37 wild-caught tadpoles collected from one of the last known wild populations in Mississippi in 2001. Since that time, the amphibian staff at the zoo's National Amphibian Conservation Center has spent years attempting to breed this frog in hopes of increasing the captive assurance population and discovering the methods needed for successful captive reproduction.

In 2008, with only four frogs remaining in our group, we came very close to success by first hibernating the frogs, then injecting them with a series of hormones along with playing audio recordings of wild male frogs calling for mates. Many eggs were laid by the female frogs, but they were unfortunately determined to be infertile.

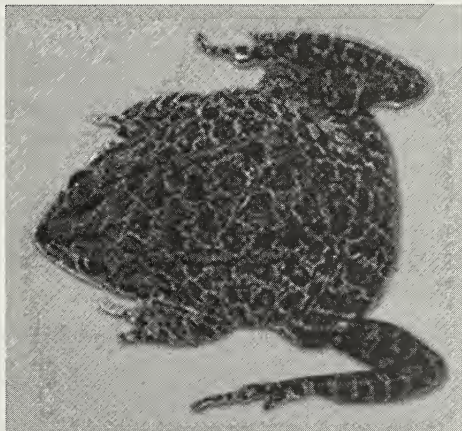
As these frogs have reached or surpassed their normal life span, this year only two individuals remain alive in Detroit. These individuals are considered to be geriatric and have several medical issues. It is believed that neither frog is eating on its own any longer. Keeper staff must now "assist-feed" them both nearly every day. One has metabolic bone disease, a very painful disease in which the bones can be easily broken. She is now under a biweekly treatment of vitamins and calcium drops as well as exposure to more UVB light to help repair her bones. The other frog has a repeated issue with fluid retention. Due to kidney problems, fluids accumulate (usually in the animal's throat and thighs) and then must be aspirated by veterinary staff on a monthly basis. Besides these individual geriatric issues, captive Mississippi gopher frogs in general are under suspicion of carrying a newly discovered pathogen assumed to be contagious to all amphibians. Therefore, special measures are taken daily and our frogs are housed and treated as though they are in a permanent, indefinite quarantine.

The good news is that recent genetic tests have confirmed that our females are unrelated to male frogs at the Memphis Zoo, making them extremely valuable genetically to the captive population.

But due to their failing health, we did not attempt hibernation with our gopher frogs this year, which means there was also no egg production. And the repeated handling and relatively invasive nature of the procedures necessary to promote egg production have prompted many discussions about balancing the potential to cause physical discomfort to our frogs with the benefits of bolstering the captive population. Animal care staff in Detroit recently participated in some very serious quality of life discussions to evaluate this issue, the first ever at our institution to focus on an amphibian species. With the help of reproductive specialists from the Memphis Zoo, we've determined methods to minimize handling while stimulating egg production with a series of hormone injections, followed by manual expression of eggs from the female frogs. Sperm will be collected from the Memphis males and the eggs fertilized in a Petri dish. If successful, the tadpoles from this breeding will add to the Mississippi gopher frog captive population both in number and in genetic diversity and we will have a new generation and a few more years to work on perfecting methods of captive reproduction of the species.

Surely every zoological institution has had the honor of housing the oldest of its kind of some creature or other over the years. In discussing these amazing cases a set of conditions comes to mind. Whether it is genetics, environment, affection, trust, compassion, medical innovation or pure luck, no one can say. Likely it is a mystical combination of all of these that allows us to participate in the achievement of such milestone lifespans. Regardless of the conditions at play, with them comes a daunting set of issues, not the least of which is "quality of life".

The Detroit Zoo firmly believes that maintaining an optimal quality of life with geriatric animals relies upon effective communication among the many people involved in providing that animal's care and having an active program and mechanism for sometimes difficult dialogue. When a flag is raised, we will call a meeting to actively evaluate the quality of life and make a decision that relies upon the input of all of those involved in the care of that animal. Sometimes the veterinary staff must simply make a judgment. But in most situations, probably 90% of the weight of that input comes from the keepers who are involved in the day-to-day care and observation of that animal. Subjectivity is always present because the perspectives are those of the humans closest to the animal and not of the animal itself. It is a serious responsibility to make decisions about the quality of life of the elderly creatures in our care. Just as our affection plays an invaluable role in elevating the quality of life of our charges, it is also possible for it to cloud our judgment or sway our thinking. We haven't the luxury of simply asking the animals how they feel. But if we are sharply tuned, and honest with ourselves, we can usually get it out of them.



0.1 Mississippi Gopher Frog, 2008

(Photo by Dana Schock)

Acknowledgements:

We would like to thank Ms. Nancy Butler, Registrar, Detroit Zoological Society for her enthusiastic contribution regarding animal statistics, Mr. Scott Carter, Director of Conservation and Animal Welfare, Detroit Zoological Society, for his comments, editorial input and institutional support, Mr. Kelly Wilson, Sr. Zookeeper, Detroit Zoological Society/President, Detroit Chapter of the American Association of Zoo Keepers for reminding us that we should try to be authors sometimes, Ms. Judy Stephens for her input on Rudy; and the Animal Supervisory and Detroit Zoological Society Leadership team for their ongoing professional support of AAZK activities.

An Easy Way Out: PVC Ladder Assists Geriatric Animals

*By Cindy Colling
Carnivore Enrichment /Research Technician
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As animals age climbing and gripping props and branches can become more difficult. A PVC meshed ladder can assist a geriatric animal in reaching areas in their enclosure and provide an easier way to reach yard access doors. We've used these ladders with coatis, red pandas, binturongs, tree kangaroos and a variety of smaller primates. These ladders are easy to make and can be made in a variety of sizes depending on location for use. They are simply a PVC ladder frame with mesh attached for climbing.

Items needed: 1" PVC, tool to cut PVC, PVC glue (if desired), PVC "t" connectors, 2 PVC corner connectors, 2 rubber end caps, plastic coated 1" x 1" metal mesh and cable ties or wire.

After the length of the finished ladder is determined, cut the PVC in 10" pieces. Start to connect ladder by placing corners pieces on each end of the first PVC piece. Then attach a "t" connector on the other ends. Place a PVC piece across and 2 more pieces down, add more connectors and continue constructing the ladder. See Fig. 1 & 2.

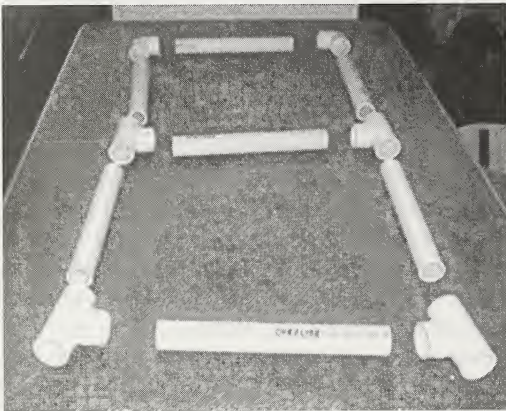


Figure 1

Figure 2

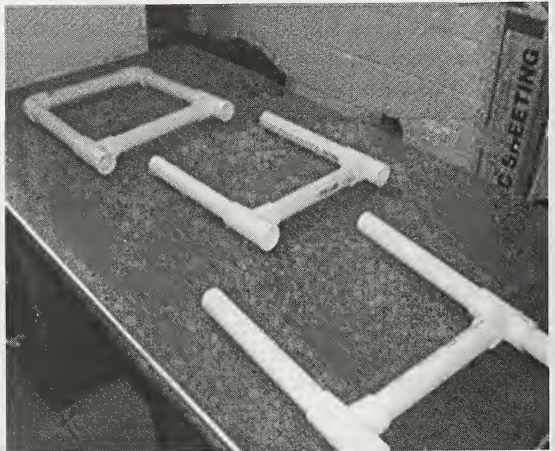




Figure 3

Connectors can be glued but once everything is pounded together it isn't usually necessary. When the ladder is the proper length, the last two pieces are capped at the end. Push and pound all connections together tightly. Bottom of ladder can also sit right on the ground without capped legs. See Fig. 3.

Cut mesh to cover ladder. File any rough edges on mesh and attach mesh to the front of the ladder. The mesh is what the animal climbs and the ladder frame gives it support. See Fig. 4. Ladder is now ready to go!

The PVC can be naturalized or painted prior to constructing ladder. Length of ladder and size of pieces can be changed to accommodate any area. Any extra PVC pieces that were cut but not used can be capped and have holes drilled into them for puzzle feeders. One project with double the fun.

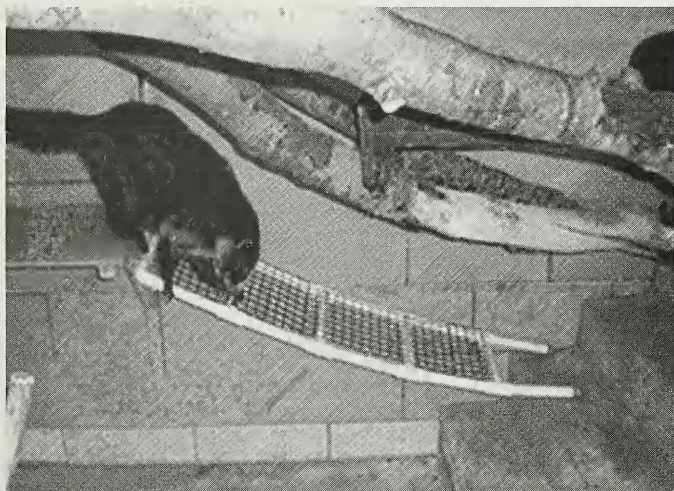


Figure 4

A special thank you to all the Management, Animal Care and Maintenance staff who help purchase, make, install and implement these wonderful devices to assist our animals.

All photos for this article taken by the author, Cindy Colling

The Old Hippo that Could

By Meghan Sharp, Animal Keeper
Cleveland Metroparks Zoo, Cleveland, OH

Abstract

Cleveland Metroparks Zoo has managed Nile hippopotamus (*Hippopotamus amphibious*) since the opening of its Pachyderm Building in 1955. Blackie, the Zoo's sole Nile hippo, who recently turned 54 years old, was the building's original resident. Because of major renovation to the building, all of its residents (including Blackie, one of the oldest Nile hippos on record) needed to be relocated prior to construction.

History

In 1955, the Cleveland Zoo acquired 1.1 Nile hippos from Africa – Blackie and Red. The one-year old hippos were housed in the soon-to-be-opened Pachyderm Building. Over the following 25 years, Blackie and Red produced 11 calves. Red died in 1981.

Blackie has long been a favorite of Zoo guests and staff. Parents enjoy telling their children stories of when they were little and came to see Blackie. Blackie has been known for his calls that echoed through the Pachyderm Building and showing off his large opened mouth. His temperament has always allowed for a rare, close-working relationship with his keepers and volunteers.



54-year-old Blackie enjoys some pool time

A new giraffe stall was transformed into a hippo pool and new giraffe holding space became hippo land use. (The Zoo's giraffe herd still gained upgraded space in addition to a giraffe restraint device.)

Modifications, Training and Planning

The Nile Hippo space in the Pachyderm Building included in indoor pool and land area and an outdoor yard with a pool. The two were connected by a shift hallway. In preparation for Blackie's move, Zoo staff installed wood doors to decrease the width of the hall and to create the appearance of a crate. Blackie would shift outside through this area but would not come inside when the doors were closed. During the winter, keepers fed Blackie in this area. The following summer, Blackie's shifting became unreliable even when the doors were not used.

Meanwhile, other animals in the building had been relocated and construction had begun outside of the building. The moving crate arrived. It was modified for Blackie's comfort and placed in the hippo yard. Blackie's "retirement condo" at the African Barn was nearing completion.

Plans

In 2003, Cleveland Metroparks Zoo started plans to expand its current elephant exhibit and renovate the Pachyderm Building. Zoo staff originally thought that Blackie could remain in the building during construction. As plans evolved, it became evident that all of the building's animals would need to be relocated. So what to do with Blackie? Finding a new home for a geriatric Nile hippo wasn't easy. After much thought and deliberation, Zoo staff decided to "tweak" plans for a planned giraffe barn expansion to include a "retirement

Keepers fed Blackie at the edge of the crate. He would enter the hallway and eat, however, if the food was in the crate, he would pull it out into the hallway without ever entering the crate. Blackie and the hallway were almost equal in length. The plan was to close the stall door behind Blackie so he could only go INTO the crate. The keepers felt if we tried to close the door prior to the move, Blackie would become wise to us and stand in the doorway. He was calm in the hallway – even with all of the construction noise around him.

For two decades, except for shifting and eating, Blackie spent all of his time in a pool. How long could he stand? Keepers started to lock him out of his pool for increasing lengths of time to prepare him for standing in his crate for what could be three to four hours.

With any animal move, special consideration is taken to minimize the stress on the animal. Because of Blackie's age, Zoo staff modified the crate and packed sand into the bottom to allow for better footing. Everyone involved with the move (including the crane operator) walked and re-walked the plan. We mapped a special route through the Zoo to accommodate the size of the crane and the truck. We needed to minimize Blackie's time in the crate because we were not sure how long he could stand. And if he did lie down, how would he get back up? During the past 20 years, Blackie was never observed lying down on land.

The Move

If success was measured by staff stress levels – on the morning of Blackie's move – Cleveland Metroparks Zoo was the most successful zoo on the planet! During the quiet hours before the Zoo opened to the public, the crane was waiting to lift a crate out of the Pachyderm Building and carry it to Blackie's retirement condo. All we had to do was get Blackie in the crate. Blackie switched to his stall, hesitated for about a second and walked into the hallway. Keepers closed the door behind him and he did not react – at all! Keepers then pushed the shift door toward him and he walked right into the crate. The crate door was closed and again no reaction. Blackie remained calm, he was responsive and even allowed his keepers to rub his gums while in the crate.



Blackie entering the pool in his new retirement "condo" that is off-exhibit in the remodeled giraffe barn.

The crane cables were attached to the crate and Blackie was lifted out of the yard and on to a flatbed truck. The crane operator would be able to detect any movement in the crate, but Blackie never even shifted his weight. The truck, followed by the crane, drove Blackie to the Africa Barn where the loading procedure was reversed. Blackie stood in the crate for a total of two hours and 45 minutes. When the crate door opened, he walked right into his new pool – and a collective sigh of relief could be heard around the Zoo.

Adjusting to Retirement

Blackie's new home is off-exhibit. The condo includes a pool and land area with floor heat. There are two areas where he can receive treats and attention – and he's getting plenty of both. Outdoor space is available for summer use. He ignores the giraffes that tower above him.

Blackie switched out of his pool the day after the move and he ate well. At the Pachyderm Building, he turned at the top of his pool and backed in. Although his new space is bigger at the top of the pool, he initially had problems navigating the turn and he'd stumble into the half-filled pool. After a few days, Zoo staff decided to lock him out of his pool and fill it (two hours) to avoid possible injury.

The first day following his "lock-out," he lay down after he ate. When the door opened, he didn't get up – until he was ready - and then he popped up like he'd done it everyday. It only took a few days for him to get into his new routine. He now switches reliably. He eats, then lies down for awhile, then gets back up and eats again.

Moving Blackie was not an easy task and certainly not one without worry. From a personal standpoint, I learned never to underestimate the abilities of older animals – just because they don't do something doesn't necessarily mean they can't.

I'd like to thank *all* the Zoo staff involved in Blackie's relocation. This animal move involved every department of the zoo and was an excellent example of teamwork and co-operation.

Photos for this article provided courtesy of Cleveland Metroparks Zoo

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It's a Geriatric Jungle Out There

By Lisa Van Slett and Megan Lumpkin, Keepers
Dallas Zoo, Dallas, TX

The Dallas Zoo knows a thing or two about caring for geriatric animals. Over the years we have housed the oldest representatives of several species. These individuals become famous across the zoo community and are known by name to regular zoo patrons. Parents bring their children to see the same animals they saw when they were younger and watch them grow and age over the years. Many times during keeper talks, people approach and tell stories they remember about specific animals from years ago.

Technology and experience have helped animals live much longer in captivity than ever before. Along with age comes a different type of care from the keepers, challenging management decisions from supervisors, and endless research and experiments from the veterinary staff. Zoos are constantly finding themselves in situations they have never been in before and are forced to find new and innovative ways to deal with the animals. Having cared for so many aging individuals with medical needs, our veterinary department has developed relationships with a number of different specialists around the Dallas area that they are able to call on when needed.

It may appear that there are no boundaries for helping geriatric animals in zoos. The Dallas Zoo has done everything from developing physical therapy programs to treat the okapi (*Okapi johnstoni*) "Fons" [25], performing cataract surgery for gorilla (*Gorilla gorilla*) "Timbo" [46], and a CT scan for spider monkey (*Ateles geoffroyi*) "Pet" [49]. As examples of special care given, keepers have found extra heaters for colder nights, laid down thicker substrate to provide traction in stalls and transfer lanes, cooked food for those with less teeth, and placed forage in more "obvious" places for elderly animals that have a hard time seeing or getting around.

Looking back through records there are two geriatric problems that appear to be prevalent in primates: runny noses and constipation. Keepers develop individual logs for these animals to monitor behavior, mobility, feces/urine, food/water and medicines. A co-worker of mine once said she did not know if she was working in a zoo or a nursing home, as it sometimes can feel that way.

Many animals succumb to diseases of the joints, bones, and muscles. Arthritis and spondylosis become common in all species. Hylamotion®, Missing Link®, Cosequin®, Carprofen® and Glycoflex® are all medicines that become part of a daily routine for older joints and muscles. Medicine is hidden in baby food, oatmeal, or sandwiches for picky eaters, and grain is softened for those with less teeth. Strawberry, chocolate, and vanilla Ensure® are all made available to the elderly primates according to their taste preference. Hoofstock that start to lose weight due to age are given extra browse and supplemental grain. Keepers have built ramps and steps to help avoid trip hazards for old hoofstock that don't pick their feet up as high while walking anymore or primates that need the extra boost over the shift door and can't jump anymore. Night keepers spend a large portion of their shifts doing extra checks on the older animals and medicating throughout the night.

One of our most famous elderly individuals is known world-wide for being one of the oldest gorillas on record. "Jenny" just died in May 2008 at the amazing age of 55. She touched so many people's lives that, when the zoo hosted her 55th birthday party, people from all over came to show their love and support. Even the "human" doctors who performed a surgery on her in the 1970's, one of them



Jenny celebrating her 55th birthday on exhibit.

(Photo courtesy of the Dallas Zoo and the Dallas Zoological Society)

unbreakable habit. Although “Bon Bon” has had access to a one-acre natural habitat for over 12 years, she has never ventured out of the transfer chute past the concrete patio onto the grass. Before the current exhibit was built, the 3.5 chimps lived in more of a 1960’s, unnatural exhibit. When construction was finished, keepers and other chimps from the group tried to convince her to go onto the grass, but still to this day she has never stepped beyond the patio. Staff gave up actively trying to coax her out after about six months and still just leave the chute open. You will see other chimps coming and going to visit her throughout the day.

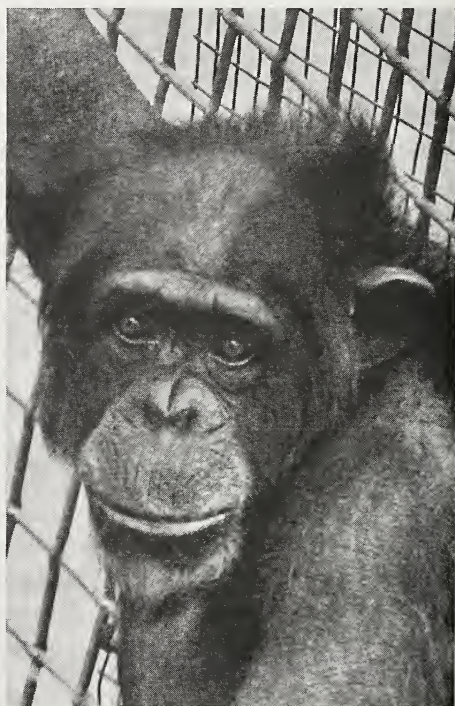
Another group famous at the Dallas Zoo are the three monkeys that have become known as “The Golden Girls”. This is a group of three black-handed spider monkeys (*Ateles geoffroyi*): “Carmen” [47], “Pet” [49], and “Rena” [51]. “Rena” is one year shy of being the oldest spider monkey on record. Sadly, the group is down to “Rena” and “Pet” after losing our beloved “Carmen” in November 2008. “Carmen” was a favorite zoo-wide and is known by people from other zoos from an AAZK conference video when she was seen expertly throwing back plastic beer bottles, appearing to drink from them. These girls were separated from the main group years ago due to medical issues and now reside in the “Monkey House”, which is no longer open to the public.

As these spider monkeys age they tend to easily develop runny noses, therefore requiring them to be locked inside more often than the younger groups.

Bon Bon, 50 years old, loves shoes and wood wool nests. (Photo courtesy of the Dallas Zoo and the Dallas Zoological Society)

in his 90’s, showed up and were still talking about how they once got to work on a gorilla. One of the amazing things about “Jenny” is that she did not require a lot of extra care or any medications into her old age. Although she was 55, she was generally healthy and went on exhibit daily. She was able to live out her life to the end with the same regular care given to the younger gorillas.

Chimpanzees (*Pan troglodytes*) “Toby” 49 and “Bon Bon” 50 also have not required a lot of medical attention in their older years. “Toby” remained the dominant male until the day he suffered a stroke on exhibit a few years ago. “Bon Bon” is now a grandmother and still in good health but is an interesting case. She is a product of the way zoos used to be designed and a creature of



This presents keepers with the challenge of enriching animals without always resorting to the instant gratification of novel food items. "Rena" is now having trouble finding peanuts in the hay due to the lack of contrast in color. "The girls" have a T.V. and radio next to their bedroom and are often found staring at cartoons. Along with age come daily medications. All three monkeys have been handled often enough in the past to allow keepers inside the enclosures with minimal argument, which we do only while crating. All three girls will allow a keeper to take their hand and guide them into a crate with ease. "Rena" will even go in on her own and "Pet" will eventually enter after some words of encouragement and a little guidance. "Carmen" would also crate with a little help.

"Rena" is in amazing health given her age. She has a history of high blood pressure, and receives Isosorbide Dinitrate daily to control the condition. She has had several eye surgeries to remove a red mass from under her eyelid, and even had to have her eyelid sewn shut for healing at one time. Due to her level of comfort with people and the work her trainers have put in, "Rena" allows ointment to be applied to her eye without complaint. "Rena" is one of the happiest monkeys around and will let you know how much she loves life by vocalizing at every person who visits. "Rena" has had seven offspring and can still communicate with one of her daughters "Rosa" who lives across the way at Primate Place. She is very recognizable with her blue eyes and distinguished wrinkles.

"Pet" is known as the ornery one of the trio. She has a history of pulling hair and has even gotten into a slap fight with a keeper trying to crate her (who unconsciously slapped right back at her!) "Pet" is not as vocal but has no problem communicating with keepers. She earned her name as she was someone's pet before she was donated to the Dallas Zoo in 1963. There are no records of her history before the zoo. She will run her hands down the mesh and pull on shift doors just in case you didn't know she wanted to go outside. "Pet" on the other hand has had more medical problems than "Rena". She had a mass removed from her stomach, which was the reason she was removed from the main group.



Rena, 51 years old, January 2009, deemed the happiest spider monkey in the world.

(Photo courtesy of the Dallas Zoo and the Dallas Zoological Society)

Last year she had lymph nodes removed after they swelled up in her neck. She will allow keepers to hand-restrain her during a blood draw without a fight and will present her hips for ointment on dry cracked skin. Most recently she was having random episodes where she would drag her left leg and curl in her toes. The veterinary department arranged for her to receive a complimentary CAT scan and a small granuloma was found in her brain. She has been on Cosequin® and Carprofen, which seem to have stopped the limping for now, and the veterinary department is researching different options for treatment. Every time we fear the worst and say our goodbyes, just in case she doesn't make it through another procedure, she pops up and comes back stronger. Currently "Pet" seems to be doing well, as if she knows "Rena" needs her to stick around to live out their lives together.

"Carmen" was a zoo favorite and is very sorely missed. She had more personality than any other animal I have known and had the ability to make every person feel like they were her favorite. She would run up to the mesh and push her Buddha-belly up to be scratched while gurgling. She was very clever and knew the right timing to steal gentle "Rena's" sandwich. "Carmen" could always find her way into jars by unscrewing caps, opening boxes, or drinking out of bottles. She would stand bipedal, balance with her prehensile tail, and throw the bottle up in the air like she was chugging the contents. Ten years ago she was diagnosed with cancer and it was decided that she was not to be aggressively treated. There was even a letter of euthanasia written in preparation. Being the fighter "Carmen" was, she stayed strong, had a ovariectomy in 1999 and a left mastectomy in 2004, and went into remission. She still presented the spot (under her arm) to people coming by where she

received so much treatment. Although she died in November, we just received the final laboratory results concluding "Carmen" died of cancer in her lungs.

Although primates can outlive most other species, they are not the only ones that require elderly care. The Wilds of Africa addition to the Dallas Zoo required an influx of several herds of various hoofstock. This happened in the mid-eighties, so in the past couple of years all the individuals have become old together. We have seen many die already, but there are still a few holding on.

In recent years, Dallas Zoo has had the privilege of caring for the three oldest okapi (*Okapia johnstoni*) in the Species Survival Plan - "Fons" [25], "Bambesa" [25], and "Kamili" [26] (who is still aging). Although okapi may reach beyond the age of 30 in captivity, less than 3% of the SSP® population exceed the age of 25. "Fons" developed osteoarthritis in both front legs. In addition to oral medication, "Fons" received physical therapy 2-3 times daily. These exercise sessions, ranging from 20 minutes to one hour in length, consisted of animal care staff (and a volunteer who was a physical therapist) leading "Fons" back and forth through four holding yards with browse. These sessions appeared to reduce the stiffness and provided mental stimulation as well. "Kamili", on the other hand, has only shown a small amount of the joint issues the others had, even though she has already passed them in age. She only spends a short time on exhibit when the weather is nice and receives a daily dose of Cosequin®.

"Bambesa" was retired from exhibit many years before she died due to traction problems while walking. Keepers made a special stall for her with limestone screenings and hay. Regular poured floors became a problem for many of the okapi and some have even developed an aversion to walking on the floors after slipping in the past. In addition to screenings, keepers also use bark mulch which keeps hooves soft in addition to providing improved traction. "Bambesa" became well-known for having a baby picture in "Life" magazine in 1982, since okapi were a relatively new animal to the public eye at that time. Dallas Zoo has had a successful



Okapi Fons, 1978 to 2003, always a gentleman, would follow you anywhere for browse.

(Photo courtesy of the Dallas Zoo and the Dallas Zoological Society)

breeding program over the years, just having had the 32nd calf. There have been many occasions when "Bambesa" has been a grandmother and all three generations were housed in the barn at the same time.

As "Bambesa" entered the geriatric group, her care became focused on her joints and diet. She received browser grain instead of ADF 16, like the rest of the okapi, and a pile of greens, since she stopped eating any other produce. Even in the end, she still ate plenty of alfalfa and hibiscus flowers. She developed arthritis and received a daily dose of Cosequin® and Banamine® in oatmeal for her joints. As her joints became worse, she did less walking and required frequent hooftrims from a farrier. Unfortunately, she had to be completely anesthetized in order to receive a hooftrim, which is always a risk with hoofstock due to the ruminant stomach and regurgitating. "Bambesa's" recovery from each procedure became slower each time, but she always seemed to pull through. In the end it was decided to euthanize her, when her joints seemed to keep her from getting up.

Retiring animals from breeding and/or exhibitry according to individual needs, Dallas Zoo strives to offer geriatric animals the highest possible quality of life. Caring for these aging individuals has proven particularly rewarding to many and demonstrates a commitment to the welfare of wild animals in captivity.

Here are some of the geriatric individuals and their ages, past and present, at the Dallas Zoo:

- “Chimera” red kangaroo (*Macropus rufus*) - 16 (w/three teeth)
- “Nikki” and “Chula”(deceased) black rhinos (*Diceros bicornis*) - both wild caught but assumed to be in their 30’s
- “Boris” the lion (*Panthera leo*) (deceased) - 17
- “Daquari” (deceased), “Cory” Dusky Titi monkey (*Callicebus moloch*) - 20, 22
- “Bibi” Black and White Colobus (*Colobus guereza*) -26
- “Rena”, “Pet”, “Carmen” (deceased), “Santos” (*Ateles geoffroyi*) -51, 49, 47, 43
- “Tucker” Cheetah (*Acinonyx jubatus*) - 17, “Tut” Caracal (*Felis caracal*)-18, “Chula” Ocelot (*Felis pardalis*) - 17
- “Jamie” swamp monkey (*Cercopithecus nigroviridis*) -30
- “Roger” mandrill (*Mandrillus sphinx*) -30
- “Toby” (deceased), “Bonbon” Chimpanzee (*Pan troglodytes*) - 49, 50
- “Jenny” (deceased), “Timbo”, “Hercules” (deceased) Gorilla (*Gorilla gorilla*) - 55, 46, 45
- “Hilde”/”Tano” (deceased) giraffe (*Giraffidae camelopardalis*) -33, 27
- “Papa” hippopotamus (*Hippopotamus amphibious*) (deceased) – Wild-caught but thought to be 53
- “Nik” Dik dik (*Madoqua guentheri*) - 19
- “Midge” (deceased) Nubian Ibex (*Capra ibex*) - 20
- “Kamili”, “Bambesa” (deceased), “Fons” (deceased) okapi (*Okapia johnstoni*) - 26, 25, 25
- “Uno” Sable (*Hippotragus niger*) - 19
- “Hodari” Yellow Back Duiker (*Cephalophus fylviculor*) -19

Special Acknowledgements:

Thank you to Todd Bowsher, Megan Lumpkin, and Linda King for gathering information from the collection past and present to help us remember all these wonderful animals in this paper and at the Dallas Zoo.

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Joint Disease and Its Management in Captive Bear Species

By Heather J. Bacon, BSc (Hons) BVSc MRCVS
Sichuan Longqiao Bear Rescue Centre
People's Republic of China

*This article reprinted with author's permission from
International Bear News, Vol. 17, No. 4, November 2008. This is the quarterly newsletter of the
International Association of Bear Research & Management (IBA)
and the IUCN/SSC Bear Specialist Group*

All six bear species are represented in captive collections around the world. As bearkeepers our knowledge of captive animal management is constantly improving and the animals under our care are living longer, and so we are increasingly faced with the problems of managing geriatric bear populations and their associated medical problems.

One of the biggest problems faced by aging bears is that of joint disease. Osteoarthritis, the commonest cause of lameness, is often caused by wear and tear on the joints, leading to erosion of the protective cartilage coating over the articular surfaces of the joints. The process of erosion is a painful one and may lead to swelling, inactivity and reduced use of the joint. Once the cartilage is damaged, inflammatory changes occur including deposition of new bone around the joint which may decrease the functional range of movement of the joint (joint fusion), meaning that the bear is no longer able to stretch or move as actively as before. These types of changes are common, not only in the limb joints, but also along the vertebral column of the spine, where they may not manifest specifically as lameness but instead as general inactivity. In addition to primary osteoarthritis, other joint problems in bears may include septic arthritis where infection of the joint has damaged the cartilage and caused secondary arthritis, traumatic injuries such as fractures, and nutritional or developmental problems which can cause poor joint conformation and lead to osteoarthritic change.

Osteoarthritis is often insidious and develops over a number of years. Rather than specific lameness, keepers may notice that a bear becomes less active, sleeps more, climbs less and is generally slower or more irritable than before. It is worth remembering that although arthritic change is an inevitable consequence in ageing joints it is definitely a condition that can be reduced in severity by appropriate management and treatment. It is never 'normal' for a bear to be stiff.

Joint problems can be minimized by the provision of a well-balanced diet that supports joint development, sensible weight monitoring, and adequate exercise facilities that build muscular strength and allow joints to be used appropriately. In the wild bears would spend much of their time traveling, foraging and climbing, and an ideal enclosure should allow for all of these activities. The restrictive captive environment in which some bears are kept may contribute to the degeneration of their joints, and so it is vital that enclosures which allow for the expression of natural behaviors are provided in order to maintain both physical and mental health. Enrichment programs that encourage climbing or swimming allow bears to engage in naturalistic behaviors and so animal management staff should be encouraged to devise comprehensive and imaginative programs to maximize the amount of time their bears spend active in the enclosure.

Obesity and mobility issues are common in captive bears and these two issues go hand-in-hand. Reducing weight obviously reduces the load carried by joints and maintenance of a healthy weight is an essential technique in preventing and managing lameness. As bears are very food motivated animals, any reduction in diet should be carefully monitored to prevent aggression occurring within a group of bears, and should ideally be timed with a natural seasonal reduction in food, e.g. late winter. Even very simple changes to diet and enrichment items can have big impacts on weight, e.g.

increasing amounts of vegetables fed, reducing amounts of high-fat or high-sugar enrichment items such as peanut butter or jam. Bears can easily be trained to stand on a weigh plate that allows their weight to be accurately recorded, and it is worth remembering that seasonal fluctuations in weight are normal. Visual assessment of body condition score is an important tool in monitoring weight changes and determining what weight is appropriate for a particular bear's frame.

However, even if factors such as diet and exercise are monitored and adjusted appropriately, bears may still develop osteoarthritis (OA) as they age. As discussed above, symptoms of this disease are often insidious and regular visual assessment plus regular physical examinations and radiographic evaluations under anesthesia are helpful in monitoring disease progression.

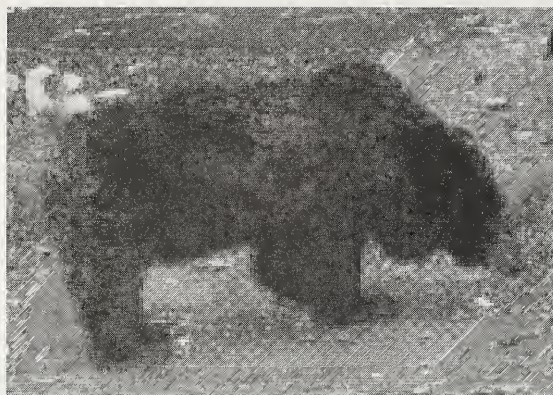
A number of therapies may be utilized in the treatment of OA. For mild symptoms or as a prophylactic treatment, nutraceutical therapy may be helpful. Supplements containing glycosaminoglycans (GAGs) provide the 'building blocks' of cartilage and can theoretically help to prevent or repair inflammation within the joint. Some studies have found GAGs to be effective and anecdotal evidence in relation to veterinary patients is promising. However, their application in animals such as bears has not yet been quantified and thus their chondroprotective effects are currently unknown. GAGs are added to a number of prescription pet foods in the UK and are commonly used as supplements. In the USA the FDA has yet to approve the addition of GAGs to animal feed, although their use as human supplements is unregulated.

Non-steroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed for osteoarthritis or general pain relief. This class of drugs works by dampening down the body's natural inflammatory response through inhibition of enzymes known as COX 1 & 2. Side effects caused by the inhibition of COX 1 may include gastrointestinal signs such as vomiting or diarrhea, stomach ulceration or increased stress on the kidneys. In general, although no specific clinical trials have been conducted on bears, these side-effects appear to be rare. Newer brands of NSAIDs select preferentially for inhibition of COX 2 rather than COX 1 thus reducing the risk of side effects. NSAIDs are extremely effective against osteoarthritic pain and generally safe even when used for long periods. Different bears respond differently to different types of NSAID. For example at the China bear rescue centre we use Carprofen, meloxicam and tepoxalin on different bears depending which drug they respond to best. A medication-free gap should always occur when switching between different types of NSAIDs, to reduce the risk of side-effects from combined drug interaction.

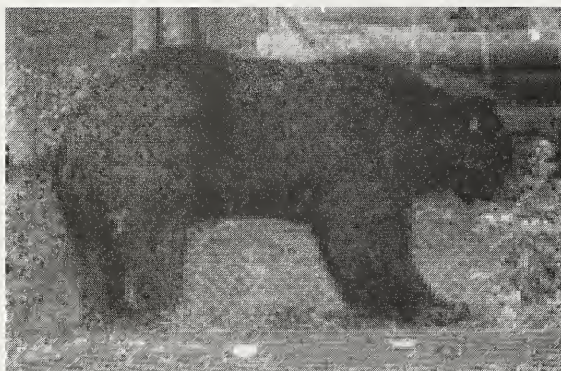
Steroids are sometimes used in the management of mobility disease, generally when the disease is caused by a neurological problem or where other therapies have failed. Steroids are generally not used as a first line treatment for chronic mobility disease as their potential side effects include those described above for NSAIDs plus increased risk of diabetes, liver disease etc. As well as be given by the oral route, steroids may be injected into arthritic joints when the bear is under general anesthesia. Intra-articular steroid injection can provide short-term relief of arthritic pain until alternative management or drug therapies are initiated. Steroids should never be used concurrently with NSAIDs.

Although not an opioid, Tramadol binds to opioid receptors in the brain through an unknown mechanism and so provides similar analgesia to opioid drugs such as morphine. Tramadol can be used concurrently with both NSAIDs and steroids and can provide very effective additional analgesia. One of the main benefits of Tramadol is that it appears to have minimal side-effects, however it should not be used with mood-enhancing drugs like selective serotonin reuptake inhibitors (SSRIs) such as fluoxetine (Prozac®) or monoamine oxidase (MAO) inhibitors.

Bears can be trained to take medications in a number of ways. Often the medication can be perceived as a reward and so if the bear is managed in a group, attention should be paid to potential conflict when the medication is offered. The most successful route in my experience is the use of fruit shakes (tablets blended with fruit and water +/- jam) offered from a plastic jug which the bear laps.



CONDITION SCORE 1: Pelvis and scapulae protruding, ribs easily palpated. Angular appearance, with no fat rounding out silhouette. A hollow will be noted between the pelvis and last rib showing virtually no fat.



CONDITION SCORE 2: Pelvis easily palpated, but good muscle covering over rump, ribs also felt on palpation, but having some muscle covering them. The hollow between the pelvis and last rib obvious, but softer.



CONDITION SCORE 3: Body is fully fleshed out. Obvious fat is present over pelvis and shoulders, ribs not visually obvious, but palpable. The hollow between the pelvis and last rib is absent.

CONDITION SCORE 4: Bear has a rounded or blocky appearance, very well fleshed over all bony areas, obvious fat over the rump and shoulders. Ribs difficult to palpate. Caudal abdominal fat visibly hanging



CONDITION SCORE 5: Legs appear too short for the body, rolls of fat on the neck and lower shoulders. Unable to palpate ribs. Caudal abdominal fat



For foul-tasting medication such as Tramadol, the tablets or capsules can be stuffed into the center of marshmallows that are then smeared in honey or sauce. The bears will generally swallow the marshmallows without chewing as long as the marshmallows are offered in quick succession (they're generally so eager to take the next one they swallow without chewing). If offered slowly the bears may chew the marshmallows and taste the tablets.

Special attention should be paid to the husbandry of elderly bears. Where possible, geriatric bear facilities should be provided with features such as non-slip flooring, low nesting areas, and sympathetically designed drains, steps, slopes, etc. that do not put strain on animals with poor mobility. Keeping staff should also be aware of the potential for sudden collapse in bears with mobility disease. If this occurs in a group situation then the collapsed bear may be mauled by conspecifics that no longer recognize their housemate.

Finally, euthanasia is a sad but important tool for the management of bears with mobility disease whose welfare cannot be adequately maintained within a facility. The bear's quality of life should always be the primary consideration when making this decision; pre-emptive euthanasia is preferable to collapse or to chronic pain caused by inadequate management. When managing joint disease in bears, a comprehensive, holistic management approach is necessary to ensure the health and welfare of these stoic animals.

Further Reading:

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www.wildlifeinformation.org

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Heather Bacon graduated from the University of Liverpool with a first class Intercalated Honours degree in Veterinary Conservation Medicine and from the University of Bristol with her BVSc. She has worked with a large variety of captive and free ranging wildlife both in the UK and abroad. She is currently the Senior Veterinary surgeon at the Animals Asia Foundation, a charity committed to raising the standards of animal welfare for wildlife and domestic species across Asia, and is based in Chengdu China.



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Never Too Late

By Jonnie Capiro, Keeeper
The Maryland Zoo, Baltimore, MD

I met Daisy Mae, a wild-caught Southern white rhinoceros (*Ceratotherium simum simum*) when I began working as a keeper at The Maryland Zoo in Baltimore in 2006. She had a reputation. She was approximately 39 years old, had lived at the zoo for 15 years, and showed little interest in training. I saw this as an invitation to get to know her and find out what motivated her. Two and a half years later, she is one of the most impressive animals I have ever worked with. She demonstrated unbelievable voluntary behaviors that led to a better understanding of her husbandry needs, and she taught me valuable lessons of the importance of time commitment and patience, especially when working with an older animal.

Instantly, she was an interesting case study to me. Very little recorded information existed about her past. Records indicated that she relocated from Kwazulu Natal, South Africa in 1968 and resided at four institutions before settling in at The Maryland Zoo. She lived in both group and solitary arrangements, and there is no written record of a formal training program prior to her arrival at the zoo. Had she ever had blood collected? Had she ever had offspring? Most likely not, but records were unclear.

I found her to be an enigma. I wanted to understand what she was interested in and how to motivate her to participate in routine visits with the veterinarians. I had so many questions, and it was apparent I would have to jump right in to find answers that could help provide the appropriate care for her advanced age.

Using Motivators to Shape Behaviors

Previous keepers developed basic training criteria to establish behaviors that would aid in her husbandry. However, due to her slow movements and inconsistency with training performance, there was no established formal training program in use when I arrived. The barn is not equipped with a restraint device, so all husbandry and medical work requires voluntary participation from the rhinos. Husbandry care consisted of routine visual examinations and hands-on work for skin and horn care. Daisy appeared to be in good health, but at her age, it was important to continue a positive working relationship between her and the veterinarians.

I began by establishing a basic goal for her: to stand in position for visual and tactile exams. A target pole would fulfill that requirement. Daisy was slow to approach the target and sometimes it took a few minutes. I unequivocally accepted her nature, however, I immediately realized the commitment to this project would be time consuming. This was not going to be a typical training program, and I designed everything to be adaptable and most importantly opportunistic.

First, I had to find a motivator. After spending many mornings just sitting with her, I soon found out that she simply wanted attention. I began feeding her alfalfa cubes, which she never really ate before, and brushing her. She seemed to look forward to this interaction every morning, greeting me instantly when I appeared at her pen.

Next, I moved on to incorporating basic behaviors, such as touching a target, holding position on cue, and lifting her head up. I used tactile reinforcement and tried to introduce food as a reward. She advanced through these behaviors in about six months and ate alfalfa cubes consistently, which became the primary reinforcement.¹

Current Health Status

Veterinarians remarked at the change in her behavior, especially her willingness to allow visits for visual examinations. They inquired about what else we could accomplish based on this foundation. They decided it would be important to weigh her and collect blood, so I began a long desensitization process for these behaviors. Using a target, I eventually led her onto a scale, which took 30-45 minutes on some days. I used the steady, or hold position command to collect blood from her cephalic vein.



Daisy Mae, White Rhinoceros at The Maryland Zoo in Baltimore
(Photo by Daniel Capiro)

Collecting blood was a huge milestone for her. It was the first time veterinarians had the opportunity to evaluate this aspect of her health. We were also able to opportunistically collect urine samples on the same day of blood collection for further evaluation of her kidney function. The analysis indicated a very healthy older rhinoceros! We were ecstatic over her accomplishments and could not wait to learn more about her.

Other husbandry goals identified along the way, such as toenail filing and skin treatments required brainstorming, creativity, and experimentation. For instance, the zoo's much younger male rhino, Stubby, was trained to put his foot on a foot box, about a six-inch step up off the ground, for toenail filing. Daisy would not lift her foot more than a few inches so, instead of using the same criteria, I slid a half-inch piece of plywood under her foot when she lifted it. This half-inch lift was enough room to file her nails.

Working with a challenging animal required frequent modification of our expectations to deliver the optimum results. It was also important to consider her limitations when developing new behaviors and not become frustrated with inconsistent or failed results. If one method proved unsuccessful, then it was time to proceed with another creative idea.

Opportunity in Advanced Husbandry

In addition to routine husbandry care for this rhinoceros, including toenail filing, horn filing, and skin treatments, age became a cause of greater health concern. The veterinarians were interested in her reproductive health. In August 2007, animal managers, keepers, and veterinarians met to discuss options for performing a reproductive examination to better understand Daisy's overall health. While previously this goal may have seemed unattainable, Daisy accomplished so much already, I had confidence that she would continue to surprise us. I began training her to turn around and present her hind end for internal examinations. After approximately eight months, spending many hours a week on this process, both veterinarians performed exams and were ready to prepare her for ultrasonography. The more involved Daisy became with training, the less she reminded us of a geriatric animal. However, there are observable physical indications of her age.

The cold Baltimore winters require the rhinoceros to remain in the barn for extended periods of time. As a result, Daisy develops mild pressure sores on her joints from increased time spent indoors. The sores were mostly moist, soft skin that was sensitive to the touch on her knees and outer toe areas. They seemed to improve during the summer, when she had daily access to the exhibit and mud wallow, but in the winter, they became more noticeable. In January 2007, the zoo installed a special floor to one of the rhino holding pens to relieve the pressure on her joints when lying down. Specialty Coating Solutions, LLC installed a spray-on polymer material to coat the concrete floor. Daisy seemed to prefer the new floor; when given the choice of substrates, she chose to rest on the coated floor. The floor seemed to help relieve joint pressure and alleviate the sores while we continued to search for a topical solution.

Once again, using patience and understanding of her behaviors, the keeper team treated the pressure sores with a well-organized approach. In December 2008, the veterinarians developed a plan to treat each of four sores with a different topical medicine and observe the results. The plan was simply an informal trial, given the many uncontrollable variables. The goal was to anecdotally observe changes or differences among the variety of treatments. The four treatment sites were: left lateral stifle, right lateral stifle, left lateral surface of the fourth digit, and right lateral surface of the fourth digit, just above the toenail. The respective treatment options were: mud (a clay/sand mixture); a paste made of an antibiotic/steroid/solvent combination (Neo-Predef[®], Pfizer Animal Health, mixed with DMSO); an antibiotic/steroid spray (Gentocin[®] spray, Schering-Plough Animal Health); and silver sulfadiazine cream (Thermazene, Kendall Company). The plan required collaboration between keeper and veterinary staff and about 20 minutes to treat these areas daily.

We cleaned the sores with a chlorhexidine scrub and dried them, except for the mud treatment site, which was not cleaned at all. Then, we applied the treatments. We cleaned the sores weekly, and photographed them to document any changes. After approximately two weeks of this trial, veterinarians eliminated silver sulfadiazine cream and Neo-Predef[®] due to lack of any improvement in the sores. We continued the treatment using mud on two sores (left stifle and right digit) and Gentocin[®] on two sores (right stifle and left digit). After two more weeks, both methods seemed to show slight improvement. In general, the sores appeared drier, firmer, less irritated, and less sensitive than before the trial. As a group, we determined that mud was the most effective treatment. We decided to continue the mud treatment daily and follow up with photo documentation throughout the winter.

Daisy provided many opportunities to learn how to better care for both of the zoo's rhinoceros. What a nice surprise to have such an old animal teach us some new tricks! I feel fortunate that I share a trusting relationship with her and am an integral part of her overall care. It is a wonderful opportunity to grow so close to an animal that is becoming a rarity in the wild. I look forward to continuing to work with her on additional potential accomplishments and spending many more healthy years with Daisy Mae.

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Assiniboine Park Zoo's Debby the Polar Bear

Debby the polar bear was accepted into the Guinness World Records Book for 2008 - at 41 years of age, she was the oldest living polar bear. The longevity record for a polar bear is 43 years, 8 months is still held by Doris, a wild-born female who lived at the Detroit Zoo from 1948-91. Debby was featured in countless media articles and shows, posed for thousands of photographs, contributed to several research studies. What is responsible for her extraordinary longevity? Excellent genetic inheritance, special care by devoted zoo keeping and veterinary staff and proper diet and exercise. Her most significant health problem was two root canals performed by Dr. Vaughan Glover in 1989.

Significant Dates:

- 1965 - Skipper, a male polar bear whose mother was shot on Baffin Island, arrives in Winnipeg with great fanfare and becomes a major attraction at the Assiniboine Park Zoo.
- 1967 - Debby and Dennis, a pair of orphan bears from Russia, arrive in Winnipeg via the Tillburg Zoo in Holland. Debby becomes Skipper's mate, while Dennis is moved to the Calgary Zoo in 1971.
- 1975 - Debby's first cub, a male, is sent to Kyoto, Japan.
- 1977 - Debby has two more cubs, one male and one female. Both are sent to Ruhr, Germany.
- 1982 - Debby has two female cubs. Both are sent to Belfast in Northern Ireland.
- 1985 - Debby's sixth and final cub, a female, is sent to Sendai Yagiyama, Japan.
- 1999 - Skipper dies at age 34 of cardiovascular problems. His ashes are scattered on Baffin Island.
- 2006 - Debby celebrates her 40th birthday.
- 2008 - Debby is euthanized at the age of 42 on 17 November, due to multiple organ failure.

Demonstrating the great adaptability of her species, Debby was active outside every day of the year, braving temperature extremes from wind-chilled -49°C [-56.2°F] in winter to humid +38°C [100.4°F] summer days. On a blustery, -30°C [-22°F] in December, 2006, a hardy group of people,



0.1 Polar Bear Debby lived to be 42 years old

(photo courtesy of Assiniboine Park Zoo)

representing staff of the Zoo and Zoological Society of Manitoba, adoring public visitors, and the media, attended a 40th-birthday celebration for Debby, at which time she was presented with a snow cake topped with a number of smoked goldeye. She gave every indication of enjoying the event, especially the fish cake. The increase in attention this celebrity garnered as each year passed was quite astonishing. Many visitors, who were youngsters when Debby arrived, brought their children and grandchildren to see this famous and loveable bear.

Even as a senior, Debby still loved to swim and play with a large plastic barrel in her pond, and eagerly awaited the arrival of her zookeeper each day, who provided a variety of tasty food items for enrichment. Like most bears, her favorite activity was eating, and she was offered quite a variety of foods. She received a daily ration of fish, moistened dog food, red meats, fish and a few vegetables. Many of these items and special treats, like smoked oysters, soups, salami and veggie-dogs, were donated by local grocery stores. When Debby required medications or supplements she quickly learned to open her mouth to accept a syringe containing her meds dissolved in a high protein health drink. *(Source: Assiniboine Park Zoo website)*

The Widower

Care of a Geriatric Bird at the National Aviary

By Sarah Shannon

*Head Keeper of Hospital Care
National Aviary, Pittsburgh, PA*

Skippy is a 24-year-old black-necked stilt [*Himantopus mexicanus knudseni*] currently living in the Veterinary Hospital at the National Aviary in Pittsburgh. He came to the hospital a few years ago after losing his female companion, to whom he was strongly bonded. You often hear the saying that birds mate for life. Skippy really took this saying to heart.



1.0 Black-necked Stilt Skipper
(Photo by Mike Faix-National Aviary)

Skippy had been living on exhibit in the Aviary's Wetlands of the Americas room with his mate and over 100 other birds whose habitats include wetlands of North, Central or South America. After the unfortunate death of his mate, Skippy's life and condition took a sudden turn for the worse. He became depressed, wouldn't eat, stopped grooming, and his condition steadily declined. The staff became very concerned about the 21-year old bird, and made the decision to bring Skippy to the hospital for a full exam and tests.

After his exam, Skippy was placed on the floor to rest and something caught his attention. In the National Aviary hospital there is a large, floor-to-ceiling mural of a variety of the Aviary's birds, including the female stilt. Skippy looked to the painting of his mate and immediately began vocalizing. He was offered food in front of the painting and started to eat again. It was decided to house Skippy next to the painting temporarily until his condition improved.



Skipper in his new enclosure. His former mate appears in the back mural.

(Photo by Sarah Shannon -National Aviary)

A new, large enclosure was made which included everything a stilt would need such as a shallow tray of sand, salt and fresh water pans, fake plants to hide in and a mirror. Skippy thrived in his new enclosure and was seen vocalizing and grooming himself in front of the painting of the female stilt.

During this time Skippy was also treated for other health conditions, including liver disease and chronic dry skin on his legs and feet. It is so severe that, if left untreated, he loses the blood supply to his toes.

Skippy previously lost a toe and most of his toenails due to this condition and as a result he is

closely monitored. Once a week we carefully clean the dry skin on his legs and toes, and apply diluted lotion. This weekly event has come to be known as "Skippy's Spa Day".

Once Skippy's condition had improved and he was stable, he was released back to the Wetlands. After a short amount of time on exhibit, however, Skippy's condition started to decline again. After multiple transfers between his home on exhibit and in the hospital it was decided that Skippy should retire to the hospital where he could continue to live out the rest of his life next to the painting of his old female companion.

At the National Aviary we care for over 800 birds, including more than 200 species. Many of the birds living here are well past their expected lifespans and are still doing great living on exhibit. However, some geriatric birds just don't get around well in their enclosure and can't compete with some of the younger birds for food or territory. Others just need a little extra heat or a softer, more comfortable environment to better suit their aging bodies.



The author soaks Skippy's feet on the stilt's "Spa Day" (Photo by Pilar Fish, DVM-National Aviary)

We have had several birds that have been retired to the hospital and were provided with a high level of care to meet all their special needs. We have even started a new program called "Meet A Patient" where we bring one of our retired hospital residents out to introduce to the public and tell them about their personal history, stories of recovery and the level of care that we provide to meet their special needs in their old age.

Skippy has become quite the crowd favorite during our "Meet A Patient" program where he melts the hearts of everyone with the story of his life as a widower and his devotion to his former companion.

Other patients that have been a part of educating the public on medical needs and care of zoo animals are Gracie, a 13-year-old Swainson's toucan [*Ramphastos swainsonii*] with a severe case of Iron Storage Disease. She is provided with a special low iron diet, iron free tea water and monthly phlebotomies to keep her iron levels normal.

Other special needs animals are Milo, a call duck [*Anas platyrhynchos*], and Heidi, a runner duck [*Anas platyrhynchos*], both of whom laid too many eggs at an advanced age and developed osteoporosis. As a result, their thin bones broke. Both recovered well after being spayed and having their bones splinted.

Some of our other high-profile patients included G-Phez, a 19-year-old southern green pheasant [*Phasianus versicolor*] that was quite the character and patrolled the hospital for years; Gus a 25-year-old great argus pheasant [*Argusianus argus argus*]; Old Man, a 27-year-old snowy egret [*Egretta thula*]; and Miss Scarlet, a 32-year-old scarlet ibis [*Eudocimus ruber*]. These geriatric birds have a high quality of life with all their special needs being met. They had custom-made pens that were padded and ramped, but made to mimic a natural environment with plants, sand, pools and hides. They get sunspots, heaters to bask in and a specialized diet with vitamin supplements.

At the National Aviary one of our main goals is to provide the highest level of care for all of our birds whether they are young or old, flying or disabled, common or endangered. Our focus in the Veterinary Hospital is to highlight these birds as individuals and share their stories of recovery with the public.

The Care and Management of Geriatric Gorillas in Captivity and the Role of Louisville Zoo's Husbandry Program

By Roby Elsner, Gorilla Forest Supervisor
Louisville Zoo, Louisville, KY

Introduction

The progression of studying and managing gorillas (*Gorilla gorilla gorilla*) in captivity over the past several decades has resulted in improved exhibition/enclosure design, veterinary care, feeding and nutrition, and social, reproductive, and behavioral management (see Hutchins et al., 2001, for a review). Field studies as well have contributed to the advancement of captive gorilla care and management (Watts, 1990; Harcourt, 1987).

As a result of improved husbandry and management, the number of elderly gorillas in captivity is growing (Erwin et al., 2002; Hutchins et al., 2001). Of the 355 gorillas currently housed at 52 Association of Zoos and Aquariums (AZA) facilities, 28 are in their 40s and six are in their 50s (Figure 1).

#	Name	Date of birth	Age	Location
1	Trudy	1956*	53	Little Rock Zoological Gardens, Little Rock, AR
2	Colo	22 Dec 1956	53	Columbus Zoo and Aquarium, Powell, OH
3	Vila	1958*	51	San Diego Wild Animal Park, Escondido, CA
4	Helen	1958*	51	Louisville Zoological Garden, Louisville, KY
5	Timmy	1959*	50	Louisville Zoological Garden, Louisville, KY
6	Shamba	1959*	50	Zoo Atlanta, Atlanta, GA
7	Alpha	1961*	48	Chicago Zoological Park, Brookfield, IL
8	Ozoum	1961*	48	Zoo Atlanta, Atlanta, GA
9	Timbo	1962*	47	Dallas Zoo, Dallas, TX
10	Femelle	1962*	47	Milwaukee County Zoological Gardens, Milwaukee, WI
11	Kathryn	1963*	46	Oklahoma City Zoological Park, Oklahoma City, OK
12	Choomba	1963*	46	Zoo Atlanta, Atlanta, GA
13	Samantha	1963*	46	Erie Zoological Gardens, Erie, PA
14	Joe	1963*	46	Gorilla Haven (Dewar Wildlife Trust), Morganton, GA
15	Pongi	1963*	46	Columbus Zoo and Aquarium, Powell, OH
16	Katanga	1963*	46	Gladys Porter Zoo, Brownsville, TX
17	Lamydoc	1963*	46	Gladys Porter Zoo, Brownsville, TX
18	Linda	1964*	45	Milwaukee County Zoological Gardens, Milwaukee, WI
19	Lulu	1964*	45	Columbus Zoo and Aquarium, Powell, OH
20	Josephine	1964*	45	Miami Metrozoo, Miami, FL
21	Ivan	1964*	45	Zoo Atlanta, Atlanta, GA
22	Muke	1965*	44	Utah's Hogle Zoo, Salt Lake City, UT
23	Mumbah	1965*	44	Columbus Zoo and Aquarium, Powell, OH
24	Alvila	3 Jun 1965	43	Zoological Society of San Diego, San Diego, CA
25	Elaine	1966*	43	Toledo Zoological Gardens, Toledo, OH
26	Ngaji	1966*	43	Milwaukee County Zoological Gardens, Milwaukee, WI
27	Holoko	1967*	42	Smithsonian National Zoological Park, Washington, DC
28	Inaki	8 Apr 1967	41	Busch Gardens, Tampa, FL
29	Fubo	1968*	41	Bronx Zoo/Wildlife Conservation Society, Bronx, NY
30	Nina	1968*	41	Woodland Park Zoological Gardens, Seattle, WA
31	Donna	1968*	41	North Carolina Zoological Park, Asheboro, NC
32	Pete	1968*	41	Woodland Park Zoological Gardens, Seattle, WA
33	Ramar	1968*	41	Chicago Zoological Park, Brookfield, IL
34	Zakula	1968*	41	Pittsburgh Zoo & Aquarium, Pittsburgh, PA

*Indicates estimated birthdate for wild-caught individuals

Figure 1. Current list of AZA gorillas over 40 years of age.

Modified facility design for geriatric gorillas

Zoos managing geriatric gorillas have adapted facility design to accommodate the needs of these older gorillas. For example, to accommodate Brookfield Zoo's Beta (Figure 2), an arthritic female



Figure 2. Brookfield Zoo's geriatric Beta using her custom-made stairs

and recipient of a total hip replacement, a stairway system was installed to ease her shifts to/from holding space to the above exhibit space (C. Demitros, pers. comm.). Other zoos as well have assisted their geriatric gorillas with shifting and overall comfort level when needed by incorporating similar stairways, strategically placed hand/foot rails, fire hoses, ropes, branches, and other furniture and structural modifications (Figure 3).

Responding AZA facilities that house gorillas aged 40 years or greater	Modifications			Citation (pers. comm.)
	Structural	Dietary	Medication	
Bronx Zoo/Wildlife Conservation Society, Bronx, NY	Yes	Yes	Yes	C. McCann
Busch Gardens, Tampa, FL	No	No	No	L. Harris
Chicago Zoological Park, Brookfield, IL	Yes	Yes	Yes	C. Demitros
Columbus Zoo and Aquarium, Powell, OH	Yes	Yes	Yes	A. Gibson
Erie Zoological Gardens, Erie, PA	No	Yes	Yes	C. Kreider
Gorilla Haven (Dewar Wildlife Trust), Morganton, GA	Yes	Yes	Yes	J. Dewar
Little Rock Zoological Gardens, Little Rock, AR	No	No	Yes	S. Tanner
Louisville Zoological Garden, Louisville, KY	Yes	Yes	Yes	R. Elsner
Milwaukee County Zoological Gardens, Milwaukee, WI	Yes	Yes	No	C. Richard
North Carolina Zoological Park, Asheboro, NC	No	No	No	T. Webb
Oklahoma City Zoological Park, Oklahoma City, OK	No	No	No	D. Scott
Pittsburgh Zoo & Aquarium, Pittsburgh, PA	Yes	Yes	Yes	K. Vacco
San Diego Wild Animal Park, Escondido, CA	No	Yes	No	P. Sexton
Smithsonian National Zoological Park, Washington, DC	No	No	Yes	L. Stevens
Toledo Zoological Gardens, Toledo, OH	Yes	Yes	No	M. Dilley
Utah's Hogle Zoo, Salt Lake City, UT	Yes	Yes	Yes	A. Henderson
Woodland Park Zoological Gardens, Seattle, WA	No	Yes	Yes	H. Bailey
Zoo Atlanta, Atlanta, GA	Yes	Yes	Yes	J. Carrigan

Figure 3. AZA facilities that responded to a survey for this paper, indicating modifications to facility design and care programs to accommodate their gorillas aged 40 years or older.

Diet and veterinary programs for geriatric gorillas

Zoos have also modified diets and medication programs when needed to meet the needs of their gorillas aged 40 years and older (Figure 3).

Other aspects of specialized veterinary care

Other aspects of specialized veterinary care include consultation from human and veterinary specialists, routine physicals, flu vaccinations, weights, urine and other biological sample submissions, and specialized training and enrichment (Figure 4).



Figure 4. Zoo Atlanta keeper Jodi Carrigan trains 48-year-old silverback Ozoum to allow blood pressure collection

Gorilla Health Project

Contributing on a more encompassing scale toward the betterment of captive gorilla health and care, including that for geriatric individuals, is the Gorilla Health Project. Since its inception at a 2006 workshop among physicians, veterinarians, pathologists, and zoo managers/keepers, its goal is the formation of a comprehensive database that incorporates information from individual gorilla's medical, nutrition, and husbandry records. Gorilla care staff can contribute greatly to this project's database by training gorillas to accept ultrasounds and allow collection of blood, blood pressure, and other biomaterials and data. This collected information will increase the current understanding of the health issues of the captive gorilla population and result in improved treatment protocols and effective means of preventing disease.

Research on geriatric gorillas

The growing number of geriatric gorillas has provided more research opportunities, which in turn contributes to better understanding and care of this demographic portion of the captive population. Research specific to geriatric gorillas has focused on skeletal and dental changes associated with aging (Nichols and Zihlman, 2002), reproductive biology and behavior (Atsalis and Margulis, 2008), cognitive behavior (Kuhar, 2004), and additional aspects of behavior associated with age (Tarou et al., 2002).

Using the experience and skills of geriatric gorillas for social management

With the growing geriatric gorilla population, there are more individuals whose life skills and experience may be applied toward social management. For example, Columbus Zoo's 46-year-old Pongi and 45-year-old Lulu have been acting as surrogate mothers, each with a hand-raised youngster, for the past several years (Figure 5). Additionally, 44-year-old silverback Mumbah has accepted these surrogated youngsters into his group, just as he has done with others in previous years (A. Gibson, pers. comm.).



Figure 5. Columbus Zoo's 45-year-old female Lulu is Umande's surrogate mother.

Louisville Zoo's geriatric gorilla program

Since the opening of Louisville Zoo's gorilla facility in 2002, a successful geriatric gorilla program has been developed. This success is attributable to several factors.

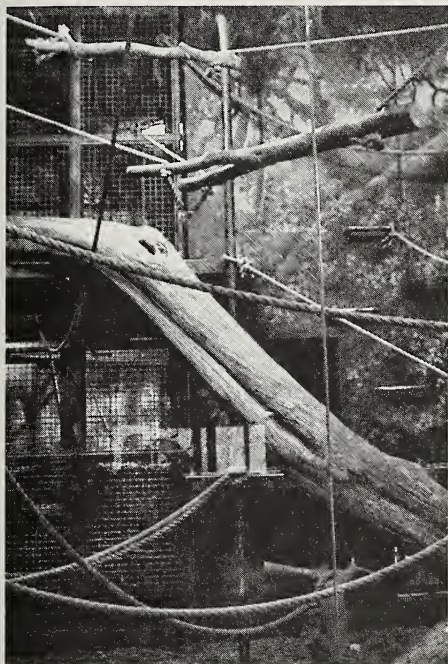
Continual access to gorillas by care staff

The gorilla facility provides its care staff with continual access to the gorillas from many areas. Behavioral observation, allocation of specialized diets, and distribution of medication are easily conducted throughout any given workday. Facility design in this regard also accommodates the area's comprehensive behavioral management program, which includes: 1) giving the gorillas as many choices and as much control as possible; 2) exhibit rotation, which keeps the gorillas active and enrolled in an exercise program; 3) flexibility; 4) many forms of feeding enrichment, including a wide variety of types of food offered, methods of presentation, and variability in the number of meals provided and times of feeding; 5) training on an individual and group basis; 6) natural and non-natural forms of enrichment; and 7) additional forms of interaction and observation by care staff.

Other aspects of facility design

Facility design provides opportunities to frequently and easily incorporate furniture—including

branches, ropes, and other structures – to accommodate geriatric gorillas in their movement (Figure 6). Further contributing to the geriatric gorillas' comfort level, the facility's two larger indoor dayrooms contain a deep layer of woodchips and the third dayroom and holding bedrooms are always heavily bedded with straw.



Both photos by author

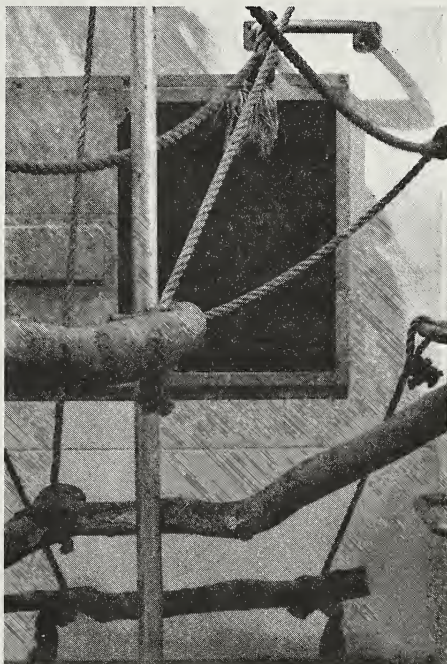


Figure 6. Like other facilities housing geriatric gorillas, furniture is strategically placed in exhibit and holding spaces to accommodate Louisville Zoo's older individuals.

Other aspects of feeding procedures

While many aspects of the feeding program are enriching for Louisville Zoo's older gorillas, some routine components of the diet specifically address the needs of these individuals, especially to facilitate compliance in the acceptance of medication and maintain healthy weights.

Each morning's first feeding consists of giving each gorilla his/her their allocated portion of a citrus fruit and a 4-oz paper cone filled with "mush" (see recipe in Figure 7), each of which contains a children's chewable vitamin. Additionally during this time, each gorilla near or over the age of 40 receives a smoothie (see recipe in Figure 8). These drinks contain glucosamine, chondroitin, flax and other oils rich in essential fatty acids, and other ingredients to provide arthritis relief and promote healthier skin and hair for the aged gorillas.

Each day's last feeding consists of giving each gorilla a favored food item from the day's diet and again, a 4-oz paper cone filled with "mush" and a smoothie to the older gorillas.

Since the aforementioned feeding techniques ensure the routine morning and afternoon acceptance of solid and liquid food items, medicating the gorillas when needed is made easier.

Also as needed, some of the geriatric gorillas receive additional daily calories with the addition of Ensure® to their morning and afternoon smoothies.

INGREDIENTS

3 lbs. Mazuri® Primate Browse biscuits
12 cups hot water
4 peeled and mashed bananas
2 cups Gerber® baby cereal

DIRECTIONS

Soften the biscuits in water, and stir into a thick paste.
Add the bananas and baby cereal until the mixture is blended well.
Refrigerate to store.

YIELD

This recipe makes ~4 quarts/liters of mush

Figure 7. Mush Recipe

INGREDIENTS *(for three smoothies)*

3 dissolved capsules U do's 3.6.9 Oil Blend®
3 dissolved capsules Ultra Botanicals® Glucosamine Chondroitin
~4 cups water
1 cup orange juice
1-2 cups fresh fruit
2 peeled bananas

DIRECTIONS

All items are added to a blender until liquefied smooth,
then evenly distributed among three cups

Figure 8. Smoothie Recipe

The daily hand-feeding of highly preferred food items within the daily diet, such as fruit and various types of cooked potatoes, helps maintain the gorillas at desired weights. Additionally, these food



Figure 9. Timmy being hand-fed.

Photo courtesy of Kara Bussabarger

items are ideal reinforcers for shifting and one-on-one/social training. The tossing of these items from the gorilla facility roof into the outdoor exhibits is also used to elicit shifting and additional exercise in the gorillas.

Primate biscuits are also hand-fed to the older gorillas to maintain them at specific weights (Figure 9).

When needed, hand-fed cooked vegetables are used to help the geriatric gorillas masticate, and make more palatable, this portion of their daily diet.

Veterinary care

Gorilla care staff has an open and communicative relationship with veterinary staff. Findings from other zoos, including both traditional and non-traditional methods, are open for review and potential implementation. The gorillas receive routine physicals. The zoo's consulting human and veterinary specialists often conduct work/investigation during geriatric gorillas' procedures, and have included ophthalmologists, obstetricians, gynecologists, dentists, nephrologists, physical therapists, cardiologists, and pathologists. The older gorillas are also weighed regularly, and urine from each gorilla near or over the age of 40 is collected once a month for urinalysis.

Communication

In-house communication among gorilla care staff and that with colleagues at other zoos are also continual and effective as well.

In-house support

Zoo management highly supports its program of housing and caring for geriatric gorillas.

Well socialized geriatric gorillas

With their life skills and experience, Louisville Zoo's geriatric gorillas themselves have contributed to enhanced social management and other components of the program's success.

Louisville Zoo Silverback Timmy

Introduction

Timmy is a Louisville Zoo geriatric gorilla who has contributed greatly to the zoo's geriatric program and become both a staff and zoogoer favorite alike, just as he was at his previous zoos. He has a history of being favored by female conspecifics as well(!). In addition to Timmy's successful charisma, his flourishing health led to a milestone 50th birthday in 2009, making him the oldest male gorilla in North America.

Location history

Timmy was wild-caught as an infant in 1959.¹ He transferred to Memphis Zoo in 1960, to Cleveland Metroparks Zoo in 1966 (Figure 10), to Bronx Zoo in 1991, and finally to Louisville Zoo in 2004 (Figure 11).



Figure 10. Timmy at Cleveland Metroparks Zoo in 1988 at age 29.



Figure 11. Timmy at Louisville Zoo in 2009 at age 50.

Social and reproductive history

Timmy spent most of his time alone at Cleveland Metroparks Zoo.² But despite being paired with three females some of that time, even with one with whom he socially bonded and bred (though she could not produce offspring), Timmy did not reproduce.

With genes valuable to the AZA gorilla population, Gorilla Species Survival Plan (SSP®) recommended Timmy's transfer to Bronx Zoo to breed with its females. Indeed, Timmy's introduction to several females was successful and less than two years following his arrival in New York, Timmy produced his first offspring. Over the next several years, Timmy bred prolifically and produced additional offspring, including a set of twins. The 12 offspring that Timmy produced at Bronx Zoo currently reside at four AZA zoos (Figure 12).

#	NAME	SEX	MOTHER	DATE OF BIRTH	CURRENT LOCATION
1	Okpara	Male	Pattycake	July 11, 1993	Boston's Franklin Park Zoo
2	Tuti	Female	Tunko	July 11, 1994	Bronx Zoo
3	Ngoma	Male	Pattycake	August 8, 1994	Omaha's Henry Doorly Zoo
4	Tambo	Male	Pattycake	August 8, 1994	Omaha's Henry Doorly Zoo
5	Chipua	Male	Triska	September 6, 1996	Detroit Zoo
6	Fran	Female	Holli	November 7, 1996	Bronx Zoo
7	Halima	Female	Huerfanita	February 17, 1997	Bronx Zoo
8	Pende	Male	Paki	January 14, 1998	Detroit Zoo
9	Leyla	Female	Huerfanita	April 29, 1998	Bronx Zoo
10	Kumi	Female	Tunuka	June 30, 1998	Bronx Zoo
11	Kongo M'bili	Male	Holli	December 31, 1998	Detroit Zoo
12	Suki	Female	Triska	July 10, 2000	Bronx Zoo

Figure 12. Timmy's living offspring.

When he reached his mid-40s, Timmy's large social group – with its growing rambunctious youngsters – seemed to overwhelm him, so he was separated to live within a smaller group with two adult females with whom he had a close relationship.

In 2004 at Bronx Zoo's request, Gorilla SSP® made the recommendation to send Timmy's 1.2 group to Louisville Zoo, ready to provide the aged silverback the amenities the facility and its program had to offer geriatric gorillas (Figure 13).

Since his arrival at Louisville Zoo, Timmy's social history/skills, personality, and intersexual appeal have facilitated the integration of four females from four different zoos into his groups, which have varied in composition over time. With his ease of acceptance, females planned for introduction to another silverback housed at the facility were initially placed in Timmy's group to facilitate their bonding. These two cohesive females, who indeed bonded with Timmy and other females

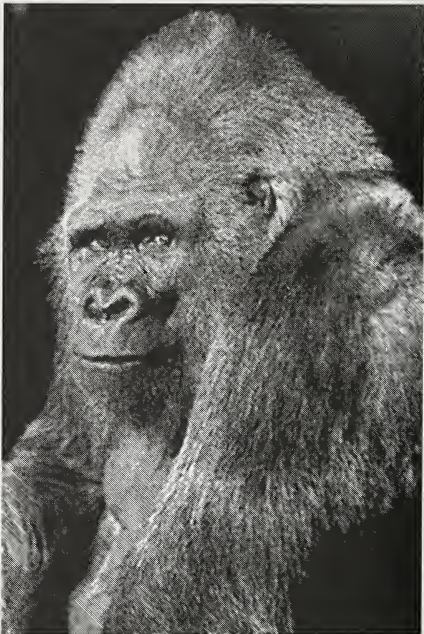


Figure 13. Timmy in 2006 at the age of 46 years.

Photo courtesy of Jan Parkes

of the group, have since been successfully introduced to the zoo's other silverback. Timmy currently resides with one of the females who transferred with him from Bronx Zoo, a 51-year-old female, as well as a 38-year-old female.

50th birthday

Two-thousand-nine is the year Timmy reached his 50th birthday, a milestone considering only two other silverbacks in the AZA population previously reached this age. For this special occasion, Louisville Zoo scheduled a January 17, 2009, celebration, which received much media, zoo visitor, and fan attention. The executive chef of one of downtown's historic hotel restaurants created a custom-made birthday "cake," made of fruit and ice and in the shape of "50," for the silverback and his females (Figure 14), and Louisville's mayor signed a special proclamation declaring it "Timmy the Gorilla Day."

Conclusion

Specialized husbandry and management techniques have been implemented with the growing number of geriatric gorillas at AZA facilities. Improved health care and more research opportunities will continue to benefit this demographic group of the captive population as well. Louisville Zoo is proud to contribute to geriatric gorilla care management at its facility, especially housing beloved individuals such as Timmy.

Acknowledgments

For their contributions to the subject matter within this article, I would like to thank:

- Brookfield Zoo's Dan Wharton for his gorilla studbook keeping and the wealth of information and interest I have derived from it.
- Brookfield Zoo, Dave Liggett, Jan Parkes, Amanda Nichols, and Michele Long for use of their photos.
- Cleveland Metroparks Zoo's Tad Schoffner and Bronx Zoo's Colleen McCann for information about Timmy.
- Cleveland Metroparks Zoo's Pam Dennis for her input on the Gorilla Health Project.
- Tara Stoinski, Kristen Lukas, Chris Kuhar, and other Gorilla SSP® members and advisors that entertain my pestering emails and phone calls regarding all things gorilla.
- Louisville Zoo's Kara Bussabarger for sticking with the plan to celebrate Timmy's 50th birthday celebration, knowing how popular it would be even outside of the Louisville Zoo and community.



Figure 14. One of the females of Timmy's group checks out his 50th birthday ice treat.

Photo courtesy of Michele Long

- AZA zoo colleagues that similarly manage and care for gorillas aged 40 years and older who responded to questions about their husbandry programs.
- And finally, the geriatric gorillas with whom I worked that have recently left us – Frank, Tunuka, Hercules, and Jenny. I also know Brookfield Zoo's Beta and Knoxville Zoo's Bibi were special gorillas as well. They are all greatly missed.

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Figure 15. Timmy looks out doorway of his exhibit in Louisville.

Photo courtesy of Kara Bussabarger

(Footnotes)

- ¹ North American zoos stopped capturing and importing gorillas from the wild in the early 1970's.
- ² Decades ago, common zoo practices often mandated the solitarily housing of gorillas. As more was learned about the social behavior of their wild counterparts, captive gorillas were more frequently housed in species-typical groupings. Today where possible, zoos are encouraged to house gorillas in species-typical harem groupings and/or all-male groups. Cleveland Metroparks Zoo was one of the first zoos to create and maintain a bachelor group of gorillas.

Gravity and Hydrotherapy Procedures as a Way to Reduce the Possibility of Stiffening Joints in Elephants After an Accident

By Alan Roocroft

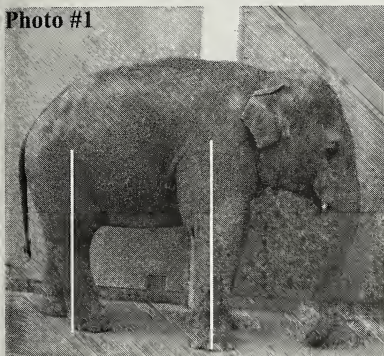
Ramona, CA, August 2006

With a section by Gina Nichols, Elephant Manager,
Santa Barbara Zoo, Santa Barbara, CA

(Editor's note: This article originally appeared in the April 2007 issue of Animal Keepers' Forum)

Elephants are not too prone to accidents in our zoos although on occasions it has happened, particularly under historic circumstances, in old-style facilities where moats were common and elephants have either fallen or been pushed in. Zoo elephants are generally out of condition, so muscle pulls can also happen. The size of an elephant's body demands that for long periods of time they must have all four legs under its weight. Structurally speaking, an elephant's leg is like the legs of a table. To

Photo #1



carry the weight, all four legs must be 90 degrees under the weight (see Photo #1). Now, take one leg off the table or incapacitate one leg of the elephant, the elephant will deteriorate and likewise the table falls over. To highlight how sensitive an elephant's stance and gait can be, I'll use the following example. Chaining elephants over night, which we did on a regular basis in the past, exposed elephants to many abnormalities in their physical and behavioral development. The next generation of captive-born elephants will be our true test as animal managers. If they are still rocking in anticipation or boredom, banging their heads against walls, waiting at doors to be let inside, and pulling their mammary glands, we failed.

Photo #1

One elephant I remember quite well arrived from an Asian zoo to a zoo in the west. The culture from which the elephant arrived had a long history of tethering elephants, mostly because the mahouts the zoo hired had a very strong philosophy concerning elephant handling, and tethering was routine when the elephants was not working. The elephant arrived in the west with a compromised front leg that appeared to be longer than the other one. As a youngster at the zoo, the elephant was chained for very long periods, a practice the culture condoned without question, but please remember not out of malice. The elephant had developed, not surprising, a stereotypical behavior because of the way and length of time it was tied. The elephant, I understand, would rock back and forth pulling on the leg that was tied, which is always the same leg in the culture of the mahouts. The leg, over time, stretched and became longer, unnoticed by the caretakers. Even the zoo management didn't notice. Unfortunately the leg became chronic and the elephant developed a life-threatening compromised leg.

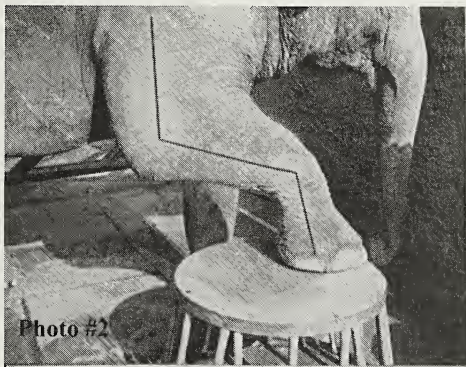


Photo #2

Photo #2

Photo # 2 shows a healthy elephant leg. See the relaxed bend in the joints and how the elephant places the foot flat on the tub. This is a very good guide when evaluating a compromised elephant leg.

It as been my experience, and I wanted to share with you, that you can help elephants mend after non-major accidents to the legs, wrists and knees.

Naturally your Veterinary Officer must be contacted when such accidents happen; such as an elephant slipping or being hurt during a confrontation with another elephant. Pulling muscles in zoo elephants can be easy because they are generally out of shape and overweight. An elephant's first response when it hurts its leg is to stiffen the joint to protect it and distribute its body weight evenly. Depending on the severity of the accident, an elephant will limp around for months not wanting to bend the leg. I have even witnessed elephants, after a long period of limping, forgetting that the leg is supposed to be hurting and in a fit of excitement run bending the leg normally. Then as if to say "wait a minute my leg is hurting", stiffen it up again. This is proof to me that they will keep a leg stiff long after the pain goes away. I believe it then becomes a habit they can't kick, and in time the tendons shrink and after a long while they cannot bend the leg anymore. This is why it is important to me that I bend the leg right after the accident, and this can be done in Free or Protected Contact elephant handling. I call this procedure "Gravity Therapy" only because it is gravity that finally makes the leg bend. The hydro-portion of the procedure relaxes the muscles and tendons so the weight of the leg when relaxed, bends. This can be done with a rear leg or a front leg. Elephants will stiffen both front and rear legs in an effort to stabilize and control their weight.

There are a number of topical solutions that can be used, but before using anything please consult your vet department. "Spirit of Camphor" is one that I have used in a liniment form on the legs of elephant. Solutions can be found that are used on horses, but for elephants they must be used in greater quantities. DMSO solution has been used when elephants are stiff in their joints with some success. If the leg is really sore, painkillers can be used to over ride the initial pain that might stop the elephant wanting to lift its leg for the therapy. This again should be in the hands of a vet and their team, which drugs for how long etc, is a professional decision.

I would like to share with you four cases of stiffening in the joints and the therapy that was offered to help and cure the elephants concerned.

Case 1. Peaches a female African elephant housed at the (SWAP) San Diego Wild Animal Park, Escondido, California, USA.

Peaches had been knocked into the moat in the outside yard. Fortunately, the moats at the time had a gradual slope on the elephant side so her fall was more of a slide and greater damage was avoided.

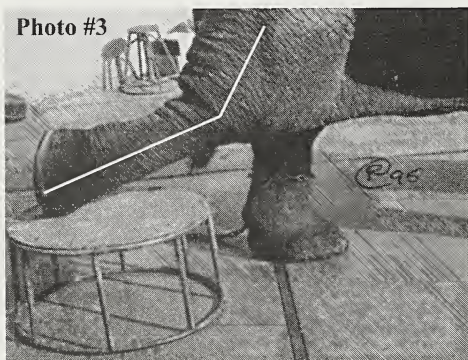


Photo #3

Peaches was not an agile animal, her build was rather round on all corners, but big to boot. She struck an impressive pose, even more so when you stood next to her. After getting out of the moat, which was a procedure in itself, she started to limp on her left rear leg. Pretty soon she held the leg completely stiff, swinging it as she walked. This to me is the danger zone for elephants that have hurt their leg joints. Over time the tendons shorten and the leg seems to lock in the stiff position and something should be done right away. Usually it is only pain relief and no more because the consequences are not as apparent to everyone, it's

only after you have seen a number of cases that you can start to connect the dots and the picture starts to mature. (see Photo #3)



ICZ
AAZK
CONFERENCE
2009 SEATTLE USA

One World, One Zoo

Today our world appears to be getting smaller. Our conference theme, One World, One Zoo, is a meaningful and an excellent opportunity to give a moment of thought to challenges we all face in this global environment.

The Space Needle, seen here as part of our conference logo, was built for the 1962 Seattle World's Fair giving visitors a glimpse of the future by presenting new inventions and facilitating cultural exchanges based on a theme that began addressing issues of humankind. That future was a larger better tomorrow.

Communication among zookeepers worldwide is improving because there is a global network evolving. We are seeing outstanding efforts in conservation, education, and husbandry that are being shared not only among members of our profession but the general public as well, making knowledge the key to the preservation of our natural resources and animal life.

Conference At A Glance:

Hosted by The Puget Sound Chapter of AAZK and Woodland Park Zoo, in conjunction with ABWAK, AAZK, AICAS, AFSA, BdZ, De Harpij, ZAP and AKAA.

Major Sponsors: The North of England Zoological Society.

On behalf of the AAZK and the ICZ organizing committee we would like to invite you to attend the 3rd International Congress on Zookeeping and 36th American Association of Zoo Keepers joint conference, held in Seattle, WA USA from 9/24/09 through 9/29/09.

Following the success of the past conferences of both organizations, this joint conference is sure to be just as successful, educational and most of all fun. The ICZ and AAZK present an excellent opportunity for zoo keepers and zoo professionals from around the world to come together and share a wealth of knowledge. We hope you will join us to enhance the zoo keeping field and look forward to seeing you there.

~Pat Owen Conference Co-Chair Puget Sound AAZK Chapter

Registration:

This year registration will be offered only online. To register click the registration link on our website www.pugetsoundaazk.org

Accommodation:

Conference will be at the Red Lion Hotel on 5th Ave, Seattle. Conveniently located in downtown Seattle, The Red Lion Hotel on Fifth Avenue offers an upscale, boutique hotel experience, personal, award-winning service, first-class meeting space, and - perhaps most importantly - breathtaking views of the Cascade Mountains, Elliot Bay, the Puget Sound and the Emerald City itself.

Getting There:

For Seattle, planes fly into SeaTac International Airport, which is approximately 25 minutes by car from the conference venue. There are several ways to get from SeaTac International Airport to the conference hotel. Ground Transportation information is available at the fully-staffed information booth in Baggage Claim near Carousel 12 (open seven days a week from 6 a.m. to 2 a.m.) and at the information booth on the third floor of the Airport Garage. For information on all modes of transportation to and from the airport, call (206) 431-5906.

Shuttle Express (van ride-share service) has agreed to offer conference attendees a discount fare. Normal rate is \$32US one way. The discount rate is \$19US one way. To receive the attendees' discount, book online using the reservation portal link: Shuttle Express—Woodland Park Zoo Conference Online Reservation Booking Portal. **Please note this is an online discount only.**

Curbside taxi service is available. The rate is approximately \$40US each way. Public busses are available for about \$2US and stop in the vicinity of the hotel. Schedules vary. Nine rental car companies have information counters in the Baggage Claim area, and five have car pick-up and drop-off at the airport on the first floor of the garage across from the Main Terminal.

Passports and Visas:

Visitors entering the United States of America need a valid passport and the appropriate American Visa. Check with your local travel agent or Diplomatic office. In addition to working with a travel agent, here is the link to learn if you need a visa to enter the US:
http://www.travel.state.gov/visa/temp/temp_1305.html

Climate:

Seattle weather is unpredictable with September temperatures ranging from 52°F to 70°F [10°-21°C]. Bring layers of casual clothes including sensible walking shoes.

Conference Language:

The conference will be held in English.

Program: Check our website for updated information www.pugetsoundaazk.org

Silent Auction:

A Silent Auction will be held as part of the evening's activities on Sunday 27 September 2009. Join us for a silent auction hosted at Red Lion Emerald Ballroom, during our silent auction you can bid on a variety of items donated by your fellow delegates. All proceeds collected will assist in furthering the goals of the AAZK/ICZ.

Pacific Northwest Information:

Seattle is a major tourist destination in the United States. They are well-organized for International Travelers with numerous money exchange services, translation services and duty-free shopping facilities available. For more information visit <http://www.portseattle.org/seatac/>

Optional Tours: Check our website for more detail information

Pre-Conference Tours:

1. Day Trip to Mt. Rainier National Park 23 September 2009

Cost: \$75.00

2. Day Trip To Pt. Defiance Zoo 24 September 2009

Cost: \$35.00

3. North Cascades Mountain Loop

- NO FOOD INCLUDED, BUT HOTEL AND TRANSPORTATION ARE INCLUDED

September 21 – September 23 Cost: \$495.00

Post Conference Tours:

1. Day Trip to Portland Oregon 30 September 2009

Take the Amtrak Cascades to Portland, Oregon and then Portland's TriMet to the Oregon Zoo. Then take the TriMet to the world famous Powells Bookstore and then back to Seattle on the Amtrak Cascades.

Cost \$59.00

2. Olympic National Park - FOOD NOT INCLUDED, BUT TRANSPORTATION - PICK UP AT HOTEL, HOTEL ACCOMODATIONS ARE INCLUDED

September 30 – October 2, 2009 \$495.00

Icebreaker: September 24, 2009, Thursday Evening 6:30-10PM

Come and enjoy a magical underwater adventure at the Seattle Aquarium. Native American dancers will be on hand to entertain you, as well as a Windows on Washington Dive show. Octopus and marine mammal feeding will also be part of the evening's activities. You will experience exhibits from Ocean Oddities, to Life on the Edge, to an underwater dome that features 360 degree views into a 400,000 gallon tank filled with fish. As you explore the Aquarium, appetizers and drinks will be available.

Chapter Challenge:

For this year's Chapter Challenge, we have two levels of donations that offer a chance to win different prizes. For a \$500 donation, your Chapter will be entered into a drawing for 1 free registration and 2 Seattle City Passes. For a \$1000 donation, your Chapter will be entered into a drawing for 1 free registration, 1 spot in a shared double room, and 2 Seattle City Passes. There will be two names pulled for each drawing!

So what is a Seattle City Pass? It is a coupon book for various attractions around Seattle. You will be able to use the book over a week's time, and it allows you to skip ahead in line for the following attractions: The Space Needle (Day & Night admission: two visits to the

top within 24 hours), the Woodland Park Zoo, the Aquarium, Argosy Cruises 1-Hour Harbor Tour, the Pacific Science Center, and either the Museum of Flight or the Experience Music Project/Science Fiction Museum. What a great way to get out on the town and see Seattle! For more info check out:

We are also looking for Sponsors for the Hospitality Suite, breaks between paper sessions, and foreign delegates. The sponsors for the Hospitality Suite are first-come, first-served. If you have any questions about the other two sponsorship opportunities, please contact Joanna Bojarski at Joanna.Bojarski@zoo.org.

Foreign Keeper Sponsorships:

This combined ICZ/AAZK conference represents the first time these two professional zoo keeper organizations have joined to bring together animal care professionals from around the world to the United States. It is of vital importance to the success of the meeting to have international participants!

We believe that a common conference for zoo keepers from around the world will not only improve the levels of communication between keepers internationally, but will serve as a basis for supporting the development of zoo keeping as a profession in regions where professional keeper associations do not currently exist. You can be that vital link in the success of this exchange. We have numerous requests for assistance right now, but have very limited funds.

Average cost to fully sponsor a foreign keeper is \$2,500, but any amount is a help! Can you help us make the conference a success for keepers all over the world by helping to bring them together? This is a rare opportunity, and it's easy to do. Simply contact Norah Farnham at Norah.Farnham@zoo.org for information on how to sponsor a keeper.

You can also add a donation when you register yourself for the conference.

Thank you for your time and consideration. If you have further questions, do not hesitate to contact any PS-AAZK member or officer.

Any Questions? Email: pugetsoundaazk@gmail.com or
Website: www.pugetsoundaazk.org

Case 2. Cookie a female Asian elephant also housed at the (SWAP) San Diego Wild Animal Park, Escondido, California, USA.

Cookie, an overweight elephant, was earlier in her career a ride elephant at the SWAP and spent a lot of time walking. When elephant rides came into question, they were discontinued. From standing much of the time on concrete floors (particularly at night), many zoo elephants become out of condition and loose muscle tone. Cookie was in Protected Contact when the therapy was performed



Photo #4

on her. Her years in Free Contact and the cues and commands she already knew helped with the procedure. We never did know what had happened to Cookie. Some thought she had slipped, but there was also a good chance it could have been the onset of gout from the very high quality diet she was receiving and all the treats she would get as part of the PC training system that was being implemented. Even arthritis was mentioned as a possible cause. We did develop a special piece of apparatus that allowed

her leg to be elevated in increments (see Photo #4). Lifting her leg gradually higher till it was at a 90-degree angle, the apparatus we designed and used could be higher and lowered depending upon the stage the animal was at in the therapy. Cookie eventually walked normally after a few weeks of the therapy.

Case 3. Hatari, a female African elephant at the (SWAP) San Diego Wild Animal Park, Escondido, California, USA.

Hatari, for those who did not know, was one of the little elephants in the film that bears her name; she played along side the "Duke", John Wayne. Hatari had for as long as I knew her always had a compromised front left wrist, so any other issue with her legs would have hit her very hard and disabled her even further. The story behind Hatari's front right leg problem grew out of a mistake and a misunderstanding of the elephant management team at the time. Too many non-cooks professing to be cooks in the kitchen. She was restrained in the yard during reconstruction of the barn and the male was released out of his house before she was taken off restraints. Consequently she pulled her leg rather hard trying to get away from the male, not knowing there was a fence between them. She started to limp almost immediately I understand, so therapy was suggested and the keepers started right away. Because the leg was very stiff she was started on a flat bale of hay, (see Photo #5). After the initial therapy the bale was turned on its end (see Photo #6). Eventually, she was graduated up to an elephant foot work tub, (see Photo #7) where over time she regained some of the motion of the leg. I have drawn lines on the photos along the leg so you can see what the initial bending ratio was and how it improved as the treatment advanced. In Photo 7, with the leg higher on the tub, you can clearly see the potential of Gravity Therapy as the knee joint bending ratio increases. The leg will gradually start to relax and bend through its own weight, stretching the tendons and muscles. Add warm water, pain relief medication and (Spirit of Camphor) to the stretching, then you have a very strong chance of salvaging the leg and joint. The use of a strong fire hose jet and pressure washers on the leg can also be important to induce blood flow, particularly if you have warm water available. The fire hose can also act like a deep muscle massage and I imagine it should feel good also. If, of course, the leg is not severely damaged, this therapy will give the elephant confidence to bend the leg and eventually walk normally again.

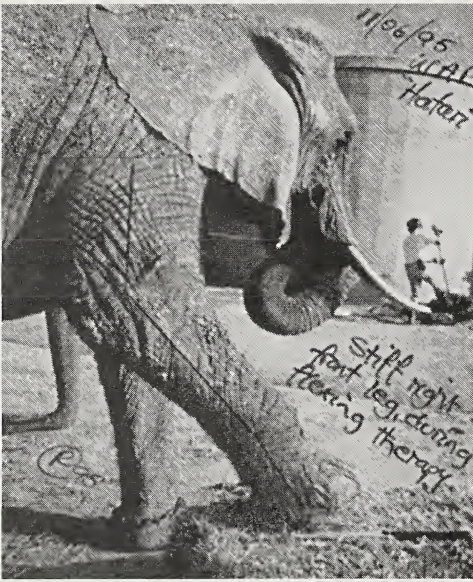


Photo #5



Photo #6



Photo #7

Case 4: Suzie a female Asian elephant housed at the San Barbara Zoo in California.

Suzie has had previous history with stiffness and injury on her LF leg. We had previously treated her w/ibuprofen when she had bouts of stiffness on her wrist. When she received the damage from her recent accident in the yard, her whole leg swung out sideways when she walked and she had no flexion in her wrist. We started hot water hydrotherapy (round rotations for a period of time over the affected areas-and the other areas/joints that she was applying more pressure to/due to her injury) and worked her through targeting her leg up on the foot bar. She first had to step back and swing her leg up awkwardly. With several repetitions of this she started to place it up with slight flexion. At that point I started to apply pressure to the front of the foot and originally had my right hand slightly

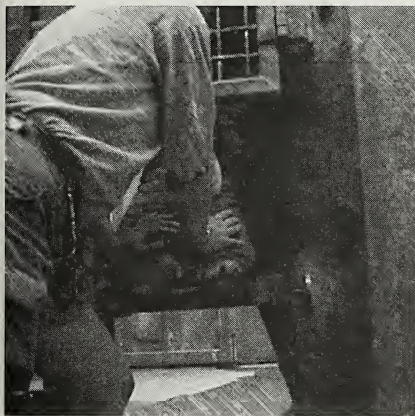


Photo #8

back to place pressure behind the wrist joint area and left hand up a few inches above the #3 nail (see Photo #8). While apply pressure to both areas she flexed her foot in better position. With multiple repetitions she eventually moved more fluently (after the first couple of days, pressure was only applied to the front of the foot). We then applied hot/warm water therapy to the same area and applied DMSO to the affected area. She moved better throughout the day after each session. Within a few days she was able to get a 90-degree bend during therapy and had a significant difference from her walk into the barn/and leaving after the session. It only took a couple of weeks to get her back to a near normal gait. We did increase her ibuprofen during this time and reduced it according to her movement. She re-injured back to normal in a couple of days. It's been a couple of months and she has not had any other problems with her

joint area. To allow easier resting access, extra sand was placed in the yard following the first injury. She continued to lie down at night. Initially her time lying down was greatly decreased, but throughout the process we noticed it became easier for her to lie down, and she lay down for longer periods of time. Initially she laid down only on one side, but she was able to lay down on both sides after the whole process was completed.

Benefits of the Therapy

Before any of these treatments or suggestion is implemented, please contact your Veterinary Department or consulting Zoo Veterinarian.

The benefits of the application of this therapy will be obviou. If an elephant that was limping or dragging a leg from a minor injury or joint strain starts to walk normally and can put normal weight back on the leg, then it is working. Other benefits where I see are in the cases of, and at the possible on-set of, arthritis, particularly in the wrist and knee joints.

As we all know from human medicine, movement is of great benefit and helps manage arthritis. Arthritis, as we also know, was and still is a huge problem in older captive elephants.

A side note: Zoos that perform regular exercise with their elephants are probably ahead of the game. Elephants that walk and climb over different terrain, have access to varying topography, either in their exhibit or on their daily walk, swim on a regular basis, - you get the point, are generally more active and I believe, are less likely to develop joint issues unless from injury.

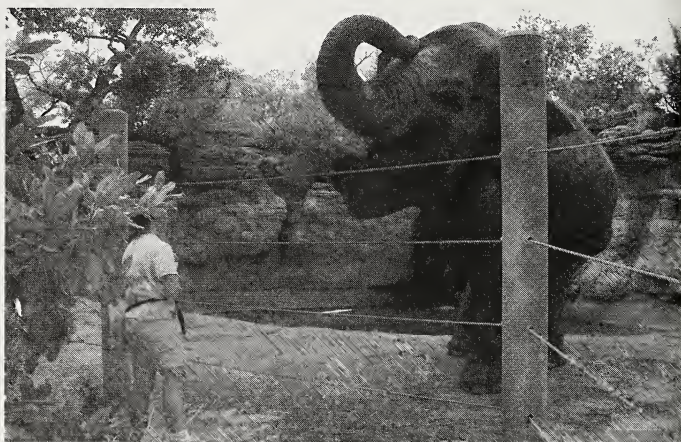
Therapy will not help in cases of confirmed abnormalities and deformation to legs and knee joints that can occur through the lack of exercise, or when an elephant is carrying excessive weight. In older elephants I have seen the shifting of the joint's center of gravity and the promotion of an abnormal gait from what appears to be bone deterioration. In my opinion at that point it is too late

to introduce health enhancements, even medication does not help in extreme cases. Strong painkillers will help ease the discomfort, but the dye has been cast for those animals.

There are two zoos I would like to point out that in their normal daily routines offer their elephants routine cardiovascular exercise and challenges on their daily walks.

Albuquerque Biological Park exercises their elephants in protected contact with a series of leg lifting behaviors front and rear and is documenting many muscle toning benefits from the exercise sequences (see Photo #9)

Photo #9



The Jerusalem Zoo in Israel takes their elephants on forging trip in and on the outskirts of the zoo. Moving over at times very hilly terrain, I watched the young elephant born at the zoo climb over obstacles that I had difficulty negotiating myself. (see Photo #10)



Photo #10

Acknowledgements

Special thanks to Gina Nichols Elephant Manager, Santa Barbara Zoo, California, USA for her contribution to this article.

A Public Relations Professional's Look at Geriatric Animals and Euthanasia

By Charlotte Roesner, Marketing Director,
Mesker Park Zoo & Botanic Garden, Evansville, IN

"So, do you guys think she's going to die soon?" asked a young reporter, fresh out of journalism school. I was being interviewed live on a local television station to promote the birthday party of Donna, the world's oldest hippopotamus (*Hippopotamus amphibius*). It was apparent that this green reporter did not think the question through thoroughly and obviously made that realization after it came out of her mouth. I'm sure we both wished we could rewind the previous question, but that not being an option, I was forced to formulate a creative answer. I explained that Donna was in great health besides some arthritis, which anyone claiming to be the oldest living of any species was sure to have. I also went on to explain that her longevity is a testament of the great care she has received for many years at our zoo. This conversation led into some interesting stories about Donna's interaction with her zoo keepers and endearing antics about her personality. The interview not only successfully promoted Donna's birthday party, but also told a colorful story about her long and enriched life at our zoo.

Public relations is a vital component of any organization and is a necessity within zoos. We deal with many issues that are unique to the industry and need to be dealt with in a delicate and compassionate manner. The presence of geriatric animals within a collection and the decision to euthanize an ailing zoo animal are two issues that require a well-implemented public relations plan. With the proper foresight, both issues can be presented to the public and the media in a way that educates and leads to better understanding of both situations with which zoos are faced. Using on-grounds education, practicing open communication with the media, and documenting milestones will help the public better understand the reasoning behind some of the decisions zoos make.

Communicating your message to all levels of zoo staff and volunteers is the key to proper on-grounds public relations. The employee selling nachos in the concession stand is just as likely to be asked an animal question by a visitor as the zoo keeper caring for the giraffes or a docent interpreting an exhibit. You want all levels of staff to know that the reason it is common to find a geriatric animal in a zoo collection is because the lifespan of captive animals far exceeds that of animals in the wild. Along the same lines, captive animals face health problems due to old age that animals in the wild seldom face because they don't live long enough to reach that stage. Just because an animal is considered geriatric does not mean their quality of life is suffering. Older animals can still enjoy themselves and their surroundings. Once these messages have been conveyed to zoo staff and volunteers, the groundwork is set for them to either formally or informally act as public relations spokespeople for the zoo.

One method to communicate your message about geriatric animals with the public is through zoo keeper talks. If a zoo keeper is planning on speaking about a particular exhibit that does contain an older animal, it is important that they address the animal's age. At this time, the zoo keeper can tell the public the many different factors that contribute to the animal's longevity. This is a great segue to bring up some of the dietary guidelines practiced by the zoo and why proper nutrition is a vital component of animal health and longevity. During the talk, discuss the expert veterinary staff who regularly examines, vaccinates, and cares for the health of not only the geriatric animal, but all animals within the zoo.

In many zoos, docents or other trained volunteers are highly visible on grounds. If they are showcasing an animal, interpreting an exhibit, or leading a program, they are very likely to hear the comment of guests regarding animals that are noticeably geriatric. Ideally, docents should be informed during their training process how to handle questions about such animals and have enough facts to let the visitor know the special care these animals receive. If an animal in the docent collection is older, the docent can point out during the talk that zoo animals receive expert care at any stage of their life. Zoo keepers and docents can act as the eyes and ears of the zoo. If they hear visitors making comments such as a particular animal looks "old" or "isn't as perky as the other animals in the collection," they should report it to their coordinator. If it seems the public is viewing this particular animal as not receiving proper care, signage could help educate the public on the animal's status. After the signage is in place, it is important to monitor the comments that visitors make to ensure the signage is achieving its purpose. If the comments are more understanding in nature, your goal has been achieved. If there seems to be no difference in the comments, it might be necessary to rework the wording of the signage.

Another method of positive public relations concerning geriatric animals is recognizing and celebrating milestones. Zoo visitors will appreciate the expert care the animals receive when they hear that the animal is having a milestone birthday or is potentially one of the oldest of its kind in the world. In the example I mentioned above, each year our zoo celebrates the birthday of Donna, the world's oldest Nile hippopotamus. This hippo has become an icon to our city and her yearly birthday party is attended by hippo lovers from around the world. Instead of hearing comments from visitors such as, "Wow, that hippo looks old," we hear comments such as "Wow! That's the world's oldest hippo! Cool!" Information on Donna's history, eating habits, daily routine, hobbies, and interests is known by all.

Donna's status as a geriatric animal has garnered much positive attention for our zoo from the media. Often, when the media is putting together a story about Donna, they also ask if we have other geriatric animals. This is a great opportunity to mention that indeed we do have others that have far exceeded their life expectancy. Of course, any time mention can be made of the great medical care, carefully formulated diets, and adequate housing for these animals, the opportunity should be taken. When the public is viewing segments of that nature, they will better appreciate the collection and what the zoo does to keep them healthy.

Although events are a fun way to recognize a milestone, they are not always necessary. As we all know, an event requires hours of planning and hours of staff and volunteer time, not to mention the costs associated with them. Alternative forms of media such as blogs, Facebook® pages, or Twitter® are great venues to share animal milestones with the public. If your website has a blog section, why not blog about the next big birthday in your animal collection? Recognizing these milestones and turning them into a human interest story will help people appreciate the older animals in your collection and why they are so special. While visiting the zoo, guests may remember a blog or post and share the story with others. You are then creating a situation where your visitors are acting as public relations persons for your organization as they share stories with those around them. Everyone likes to be viewed as an expert and they will really take ownership in your collection if they feel they have "inside information."

As animals age and their health deteriorates, zoos are sometimes faced with the difficult decision of euthanizing an animal. When an animal is visibly suffering or undergoing treatment, the public tends to take notice. One particular case comes to mind at our zoo. A Przewalski horse (*Equus caballus przewalskii*) in our collection was suffering severe health problems. Our entire animal department and veterinary staff and specialists were doing all they could to nurse this horse back to health. In the meantime, zoo visitors noticed the animal was in poor health. Although the animal was frequently seen receiving medical treatment and we had placed signs about the horse's condition, a visitor still called a local television station to bring the situation to their attention. In the era of cell

phones, with communication at their fingertips, it is not uncommon for a visitor to see something of concern and make a call on the spot.

After receiving a phone call from the television station about the Przewalski horse situation, I decided the best bet was to be proactive with the media. I graciously accepted the request for the station to come to the zoo and put together a story on the horse. Before they arrived, I put together a list of talking points for our director to have on hand during the interview. It included the one-on-one attention the horse received from the zoo keepers, the veterinary staff, and the equine specialist who was hired to care for this animal. The special provisions that were made such as bedding and a special diet were also included. Information on the animal's condition and the progression of the condition was gathered for background information. When our director delivered the interview in a companionate manner, the Przewalski horse story tugged on the heartstrings of viewers and showed them how much the zoo cares for each animal in its collection. This situation illustrates how being open about health problems in the animal collection can allow the zoo to control the angle of the story.

After the story aired, I observed that the comments coming from the Przewalski horse viewing area were a lot more compassionate. Instead of being angry at the zoo for not caring for its animals, people commented that it was great the zoo was doing all it could for the horse and they hoped the treatments worked. Unfortunately, this particular animal had to be euthanized when the treatments were no longer working and the animal's quality of life had diminished. When I issued the press release announcing the animal's passing, the media were very compassionate and respectful to the zoo. I attribute this to being proactive about the situation and keeping an open and honest channel of communication.

An open channel of communication with the media is very important when dealing with euthanasia. Many times, the news media can be quick to sensationalize a story and start down a negative path. While you don't need to send out a media release every time your facility is faced with the difficult task of euthanizing an animal, sending them out for the larger, more charismatic animals is a must. The public will notice that the animal is gone and it is best to present the accurate facts before rumors start flying.

First of all, make sure your facility has a media plan in place for dealing with euthanasia. This will make things easier and less confusing when the difficult time presents itself. When in contact with the media, be open, honest, and factual. Being concise and to the point, sharing the essential facts first, is a way to ensure the story includes everything you feel is important. Always display deep compassion when telling your story to the media. Having to euthanize an animal is a very sad situation for zoo staff, and viewers will be able to detect your somber manner and be more companionate to the zoo. Also remember, zoo staff aren't the only people to mourn the loss of an animal, visitors can also be sad about the loss of the euthanized animal. During the interview, sharing with the public the fact that all treatment options for the animals were exhausted can be reassuring. This shows the public that the zoo did not make any rash decisions when it came to this matter and tried all they could to keep the animal's quality of life uncompromised.

While the image of geriatric animals in a collection and the decision to euthanize a suffering animal are not necessarily a favorite subject, they are part of everyday life at the zoo. Never apologize for older animals in your collection but celebrate their longevity with your visitors. They are a vital chapter in the story of the circle of life. And when you have to euthanize an animal, you can use this as an occasion to showcase your facility's devotion and attention to each animal to the end.

Donna the Hippo is 57 Years Old

Lives at Evansville's Mesker Park Zoo & Botanic Garden

- Donna is a Nile hippopotamus (*Hippopotamus amphibius*)
- She is 57 years old, and from all the records we can find, the oldest living Nile hippo in captivity.
- Evansville's Mesker Park Zoo & Botanic Garden acquired Donna on 7 August 1956 from the Miami Rare Bird Farm. However, she originally came from the Overton Park Zoo, which later became the Memphis Zoo. She has lived in the Kley Building since then!
- Donna has had all eight of her babies while living at Evansville's Mesker Park Zoo & Botanic Garden.
- On her last weigh in, Donna was 4,063 pounds [1,483kg].
- Her daily diet consists of a variety of food, including two oranges, a tomato, a sweet potato, an apple, corn on the cob, and two bananas. She also eats about 12 1/2 pounds of grain made for herbivores, along with four flakes of Timothy hay and two flakes of alfalfa.
- Every day Donna takes a vitamin and mineral supplement called Lixotinic as well as Phenylbutazone tabs for her arthritis.
- Donna has an indoor heated pool (74-75°F/23.4-23.8°C]) and also an outdoor pool to float in during warm days when the pool temperature is above 60°F [15.55°C]. Donna spends most of her day in the water, sometime submerged for five to eight minutes before surfacing for air.
- Her mate was Kley and he died when he was about 30 years old.
- Donna enjoys having her lower lip rubbed by her keepers.
- As a special treat during the summer, Donna gets a hippo sized Popsicle™ made by filling a five-gallon bucket with fresh fruit and water and then freezing during her annual birthday party in July.



0.1 Nile Hippo Donna in her pool at the Mesker Park Zoo & Botanic Garden

(Photo courtesy Mesker Park Zoo & Botanic Garden)

Using Cue Conditioning to Facilitate Voluntary Separation for Supplemental Feeding in a Geriatric 0.1 Scimitar-horned Oryx (*Oryx dammah*)

By Sarah Colman, Senior Mammal Keeper, Dallas Zoo
Mike Glover, Mammal Supervisor, Dallas Zoo, Dallas, TX

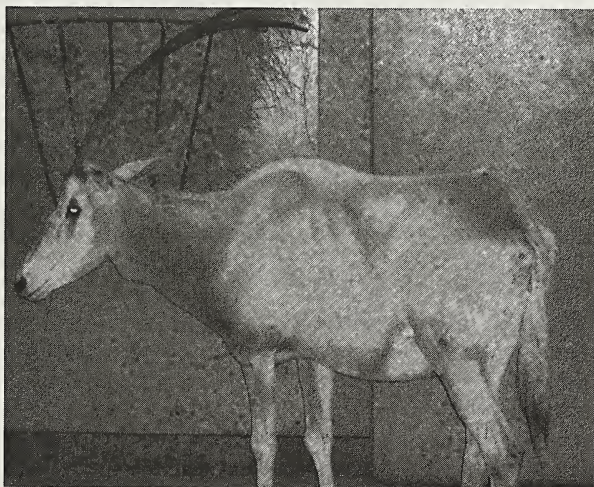
Introduction

The Dallas Zoo currently houses 2.5 scimitar-horned oryx (*Oryx dammah*). One of our herd members is 0.1 Pegasus. Pegasus was born at the National Zoo on 22 September 1987 and came to the Dallas Zoo in 1990. She integrated well into the Dallas Zoo herd and produced one male calf in 1991. Apart from a severe trauma wound to her flank in 1997, Pegasus was in good health throughout her life. She had consistently maintained a low rank in the herd hierarchy.

In spring of 2006, a new bull was introduced to the herd for breeding. Despite Pegasus' advanced age (18 at the time) he offered courtship behaviors to her on an almost constant basis and mounted her daily. By late summer, Pegasus had sustained multiple minor wounds to her rear legs and had exhibited periods of lameness, thought by keepers to be the result of the bull's continuous pursuit of her. Despite the fact that the bull was rarely aggressive toward her, it was clear that his attention was beginning to have a negative impact on Pegasus' health.

By November 2006, keepers saw clear signs that she was beginning a serious decline. Her body condition had become poor, with her hips, ribs, and spine clearly visible. Her coat had become rough, dull, and patchy, and she was often very stiff in both rear legs. Keepers also noticed she seemed less energetic and alert than usual, often standing with her head held low and back hunched. In a relatively short amount of time, Pegasus had gone from an apparently healthy animal to one that both looked and acted as though her age had finally caught up with her.

The animal care staff discussed Pegasus' situation at length and agreed that immediate action was necessary. Aside from her emaciation, there were no obvious signs of an acute health condition. The risk factors of a sedation and examination with this species, and Pegasus in particular given her past history of numerous renarcotization incidents, were significant enough that the animal care and veterinarian team resolved to attempt resolution of her nutritional deficiency before escalating her treatment. After consulting with the veterinary staff and zoo's nutritionist, a plan of action was devised. The plan was three-fold: 1) separate Pegasus from



Pegasus before initiation of program

the herd to give her time away from the bull to return to a healthy state, 2) introduce supplemental food in addition to her regular diet to help her recover and maintain a healthy body condition, and 3) initiate an operant conditioning program to train Pegasus to voluntarily separate herself from the herd so that she could receive her supplemental food on a consistent basis once reintroduced. Two

keepers were selected to oversee the cue conditioning program, and with that, "Plan Pegasus" went into action.

Methods

Separation from the herd

The first step on Pegasus' road to recovery was to be separated from the rest of the oryx herd. Of the three parts of the plan to help Pegasus, this step had inspired the most discussion and concerns. Pegasus had never been separated from the herd for any extended period of time, and even when isolated for treatment of a severe wound in 1997, she was given a companion after only a few days. We anticipated that she would need to be separated for at least several weeks, if not a few months, to both let her regain body condition and be successfully conditioned to come to a designated location on cue for food. There was concern that the stress associated with such long-term isolation would be a detriment to Pegasus' already declining health. Concerns were raised about long-term management of Pegasus as a single animal should supplemental feeding and cue conditioning fail, or if reintroduction to the herd went poorly and she had to be separated permanently for her safety. However, everyone eventually agreed that separation from the herd would expedite immediate improvement of her health through supplemental feeding and streamline the cue conditioning process. With this in mind, the decision was made to move forward with separating Pegasus from the herd.

Once it became definite that Pegasus would be separated from the rest of the herd for an undetermined amount of time, animal care staff began to discuss how to manage her as a single individual. The keepers wanted to ensure that she was as comfortable as possible and had opportunities to relieve the stress and boredom associated with extended isolation from the herd. To that end, small modifications were made to the stall and yards she would inhabit, care was taken to add her as a separate individual to the daily enrichment schedule, and she was given additional space each day to exercise.

Changes to Pegasus' new stall and yards were simple. To provide comfortable spots to lie, piles of sand were put in the yards, and she received a fresh hay bed in her stall daily. The herd was given access to a yard that shared a fence line with Pegasus' new yard, ensuring that for at least some part of each day she was able to interact socially with the other herd members. Part of the shared fence line was left without a visual barrier of any kind to allow tactile access between Pegasus and the other herd members.

Keepers made sure to give Pegasus enrichment several times each week to help combat stress and boredom. She received browse on an almost daily basis and always had items available for sparring, such as tree branches, Christmas trees, and bamboo. Scattered produce and ice treats were used to provide novel food presentation. Spices, extracts, and herbs were used to scent Pegasus' bed, sparring items, and yard furniture. She sometimes received feces or used bedding from the herd, providing her with additional enrichment opportunities.

To encourage Pegasus to exercise, she was given access to additional holding yards once the rest of the herd had been shifted onto exhibit from their holding area. Her enrichment items and free choice coastal hay were offered throughout her allowed stalls and yards, providing motivation to move around the space and get much-needed exercise. The additional stall and yards had been Pegasus' home for many years, and keepers felt that providing her access to familiar territory would help her be more comfortable and confident during her period of separation. At the close of each day, she was called back into her separation stalls and fed her grain diet.

Introduction of supplemental food

When with the herd, Pegasus readily consumed her allotted daily diet, which consisted of one quart Mazuri® ADF 25, two scoops of Vetri-Science Laboratories Glyco-flex® II EQ joint and connective tissue support, 1/2 carrot (sliced), and free choice coastal hay. No herd members were observed keeping her from approaching to eat, nor did any of the other animals interrupt her while she ate.

Despite this, it was clear that her current diet was not enough for her to maintain a healthy body condition. Keepers consulted with the zoo's nutritionist to determine what dietary changes would need to be implemented to help Pegasus recover and maintain condition.

The nutritionist decided that one cup of Purina Mills Athlete® and 1/2 flake alfalfa would be added to Pegasus' diet. Athlete® is a supplemental grain formulated to be high in protein and fat and is intended for horses involved in physically demanding activities. It is highly palatable and can help improve hair, skin, and hoof condition. With all these factors in mind, it seemed to be the perfect choice to help Pegasus regain body and coat condition. Keepers added the Athlete® to her diet and she consumed it readily from the start. Alfalfa was added to Pegasus's daily diet for its much needed protein content. In the past, alfalfa was used only as an enrichment item for the scimitar-horned oryx, so keepers encountered no problems in getting her to consume it readily. After some discussion, keepers decided that the Athlete® and alfalfa would be fed at the beginning of each day and the remainder of Pegasus's grain diet and carrot at closing, with coastal hay offered free choice at all times as usual.

Operant conditioning

For the remainder of this article, the phrase "cue conditioning" will be substituted for the standard terminology "operant conditioning", as it is more specific to the context of the process used. The final step in the plan involved conditioning her to come to a designated location on cue to receive her supplemental food on a consistent basis. As Pegasus was a low-ranking animal, the animal care team decided that it would be necessary to lock her into a stall with her extra food. This would prevent other herd members from displacing her and eating the food themselves. Therefore, for the conditioning to be considered successful, she would have to voluntarily separate herself from the herd each day when asked, come into a stall, and then allow herself to be locked inside. For a geriatric animal that had never been a part of any formal training program and was not considered particularly tractable or keeper-friendly, this seemed like a tall order. However, we felt that a behavior capturing technique could be used and her natural behavior of seeking out food and remembering its location could be attached to an auditory cue. It was agreed that if this conditioning was unsuccessful, Pegasus' reintroduction to the herd would result in her continued decline. Thus, the remainder of her life could have been in semi-isolation, perhaps with only a stall mate.

Two keepers were selected to devise and implement a cue-conditioning program. One keeper was designated the primary trainer and one the secondary trainer. Staff agreed that only these two keepers would do Pegasus' conditioning each day to maintain consistency and thus, increase the chances of success. A log was kept where trainers recorded how each session had gone. The primary trainer's job was to devise the shaping plan for the cue conditioning, to write a monthly report on the program's progress, and to judge when it was time to move from one step in the shaping plan to the next step. The secondary trainer was responsible for maintaining the conditioning when the primary trainer was unavailable, offering input for monthly reports, and assisting in assessment of the program's progress.

The goal of the cue-conditioning program was to have Pegasus respond to a specific cue by coming into a stall where she would be locked inside to eat her extra food. A triangular dinner bell was chosen as the sound for the cue because Pegasus had no previous associations with the sound, it was sufficiently loud to carry throughout the yards and barn, and one happened to be available. The trainers decided that a single strike of the triangle would be the cue as it could be easily demonstrated to and duplicated by others once the conditioning was complete.

The primary trainer designed a plan aimed at forming a strong association with the cue and the presentation of the Athlete® and alfalfa. At first, the triangle would be rung as Pegasus ate the grain. Initially, she was frightened of the noise and left the barn, only returning when keepers had left the immediate stall area. This only happened on the first day, however, and the next day she showed no fear of the triangle noise, nor did she on any other occasion following. Gradually, the trainers began

to offer the triangle ring at earlier and earlier stages, beginning with ringing timed to the descent of Pegasus's head toward the bowl, her approach to the bowl, and finally, her entrance into the stall. Sessions were very short, taking only as long it took for her to eat the grain.

It should be mentioned that great care was taken to prevent even the slightest accidental ringing of the cue. Such an occurrence had the potential to cause setbacks, as it could introduce an entirely different context into the training environment. Trainers wanted the sound of the triangle to mean one, and only one, thing to Pegasus: "Food is available now. Go quickly to the eating place."

Once the primary trainer was satisfied that the connection between the cue and the food was clearly established, Pegasus was given increasingly more space and the cue was given to see if she would come seek out the food where she was used to it being presented. The first day she was given all the stalls and yards on one side of the barn, one trainer watched her in the yard while the other trainer went into the barn and rang the triangle. Both trainers were very pleased to see that when the triangle was rung, Pegasus responded immediately by leaving the hayrack where she was eating, heading into the barn, and going straight into the stall where her food was usually presented. The conditioning had been a success. As the days went by, Pegasus began responding more and more quickly to the cue, until the time from cue to having her at the bowl eating was 10 seconds or less.

Now that Pegasus responded quickly and consistently to the cue to come inside the barn to eat, trainers began to fine-tune the conditioning. They anticipated that once Pegasus was back in the herd, some herd members might, for curiosity or other reasons, follow her into her feeding stall. It was very important that no animal but Pegasus be reinforced for responding to the triangle cue. Trainers began waiting until Pegasus had successfully arrived in the designated feeding stall to present the food, getting her used to a delay in food presentation in case they had to wait for other animals to leave the stall for her to eat. They also began getting Pegasus used to having the door to her feeding stall closed while she ate so that no other herd members could interrupt her. The stall door was operated on electric power with a switch outside the stall, so trainers began by simply moving the door a few inches closed while she ate. Gradually, the trainers worked up to having the door fully closed while Pegasus consumed her Athlete® and alfalfa. At this point, the trainers determined that her cue conditioning was completed. Once she had regained a healthy body condition, Pegasus would be reintroduced to the herd.

Results and Discussion

Physical improvement and behavioral changes

As previously stated, Pegasus had, in a relatively short amount of time, undergone a rapid physical decline. She had lost weight and her hips, ribs, and spine had become prominent. She also appeared to have lost muscle mass in both thighs. Her coat had become dull, rough, and thin, with patches of hair loss over her body. Pegasus experienced periods of lameness and joint stiffness in her rear legs, and often displayed a hunched body posture with her head held low. In addition, she seemed sluggish and less alert than keepers were used to seeing.

One month after being separated from the herd and being provided with supplemental food daily, keepers began to see a definite improvement in Pegasus. The first changes were in her coat condition. The hair loss stopped and thinning areas began to grow back. Her coat became shiny and smooth once more and her tail began to look less dry and tangled. By the end of her second month of isolation, her coat condition was better than it had been in years.

Recovery of body condition was a slower process, requiring five months. Unfortunately, weight data is unavailable at this time. However, over time, keepers noticed Pegasus' hips and spine stopped showing, and she seemed to regain mass in her thighs and rump area. She also had fewer episodes of lameness and rear leg stiffness. Although her ribs remained visible, her flank area, girth area, and barrel filled out once more, giving her a much healthier overall appearance. Her posture improved considerably and keepers stopped seeing her stand with her back hunched and head down.

Pegasus' return to a healthy condition was marked with behavioral changes as well as physical ones. Always a low-ranking herd member, she had never been interested in keeper attention and always took care to remain out of the way of keepers cleaning in the holding areas. She had no history of aggression toward keepers or other herd members. As Pegasus improved physically, keepers noticed more displays of energy. When given her additional stalls and yards, she began taking a few quick laps around the extra space, seemingly to "let off some steam" and stretch her legs. Sparring with enrichment items became more vigorous. Pegasus also seemed more interested in keepers than ever before and started to approach keepers as they cleaned and put out hay.



Pegasus after supplemental feeding and operant conditioning program had restored her health.

There were also instances where she seemed to challenge keepers by displaying head-high alert posture and being slow to move away as she approached her. It was clear that Pegasus was feeling better as well as looking better.

Herd reintroduction

Once cue conditioning was deemed complete and Pegasus had returned to a healthy body condition, the next step was reintroduction to the herd. She had been separated for five months when keepers judged she was ready to be reintroduced. A week of all day/overnight fence line howdies were done to give keepers an idea of the amount of aggression she would face from the rest of the herd. As expected, the bull was very interested in her and spent a lot of time near the howdy area. However, beyond one aggressive incident from one of the females on the first day of howdies, the herd paid Pegasus little attention.

The reintroduction went very smoothly, and she quickly reintegrated into the herd. With the reintroduction safely behind her, the next big hurdle would be seeing if Pegasus would continue to respond consistently to the triangle cue by coming into the barn and being locked in for her extra food.

Keepers anticipated that Pegasus' response to the cue might deteriorate for a short time following reintroduction to the herd, so it came as no surprise that the day after the reintroduction, Pegasus did not come in to eat when cued. By the third day following reintroduction, she was back to responding to the cue as usual. However, a new problem presented itself. The bull in the herd began to become agitated each morning when Pegasus left the group and was locked into the barn to eat. He began following Pegasus into the barn and herding her back out into the yard with the rest of the group or blocking her from entering the barn entirely. Though she tried entering through different doors or waiting until he was out of sight to respond to the cue, eventually the bull began waiting inside the barn each morning to ensure she could not come in to eat. This threatened to undo all that had been achieved. Station training the bull was discussed, but his primary motivation has always been to control his herd. Therefore such training would be costly, as far as time duration. Fortunately, nature provided some relief from this situation. The onset of winter weather meant that the bull was often separated from the herd as he was too aggressive to be locked into the barn with the females during bouts of very cold weather. This gave keepers time to think about how to solve this new problem in food delivery for Pegasus.

During the time she had been isolated, Pegasus had come to respond reliably calling her name to move her from her extra yards back to her regular stall and yard in order to offer her regular grain diet in the evenings. She had also become comfortable with close keeper proximity. Keepers wondered if she would come to a keeper calling her name. If so, it was possible Pegasus could be called to a location in the holding yard where keepers could stay nearby, deterring the bull with their presence while she ate. This proved effective, giving keepers a second option for supplemental food delivery when the bull was present in the herd. Keepers decided that the triangle cue would continue to be used whenever the bull was separated from the herd and calling Pegasus to a spot in the yard would be used whenever the bull was present. She adapted quickly to these changes, surprising keepers with her rapid understanding of what they needed her to do.

The problem of consistent food delivery for Pegasus was now solved. As time went by and her health continued to improve, keepers made some surprising observations. Pegasus, who had always been documented as being near the bottom of the herd hierarchy throughout her time at Dallas, had worked her way up to alpha female of the herd. She displaced all other females readily at hayracks and food bowls, and was observed sparring with other herd members until they submitted. Pegasus also began approaching keepers more readily and with more confidence than ever before. Her return to health and increased energy had had a dramatic difference on her behavior, one that in turn affected the entire herd dynamic. At the ripe old age of 20, Pegasus was now herd leader.

Pegasus today

Today, Pegasus is a typical scimitar-horned oryx, complete with an assertive, confident attitude and no major health issues. She remains the undisputed leader of the female hierarchy. She continues to receive her Athlete® each day and still responds reliably to her triangle cue, although it is not used every day, but only when the bull is separated from the herd. After an assessment by the veterinary staff and the zoo's nutritionist, it was determined that Pegasus no longer needed alfalfa on a daily basis and this has gone back to an enrichment-only food item.

The keepers' journey with Pegasus in helping her recover was a long one, full of concerns, discussions, successes, and setbacks. When it all started, some were doubtful that she could make a significant recovery from the state she was in. The keepers were determined to help Pegasus enjoy her golden years and grow old as comfortably and gracefully as she could. They counted the investment of time and effort into her recovery as time and effort very well spent. Comparing pictures of Pegasus just prior to the start of her isolation to the Pegasus of today, it is difficult to believe that they are of the same animal. A little time, careful planning, and teamwork really do go a long way and make a big difference.

The focus of this entire process was upon improving Pegasus' physical health. Unfortunately, less regard was placed upon measuring changes in her behavior, excepting observations that applied to the assessment and adjustment of the training protocol. This was partially due to limitations in allocation of resources to this project. Staff also did not assess the enrichment value of the training program, although training is considered an important enrichment option. However, in spite of the lack of quantifiable behavioral data, it seems that the training process changed not only her physical health, but her observable behavior as well, at least as it relates to her apparent confidence, security, and status within the herd.

In September 2009, Pegasus will be celebrating her 22nd birthday. Keepers are hopeful that with continued special attention to her needs as a geriatric animal, she will be here for staff and visitors to enjoy and learn from for many more birthdays to come.

Acknowledgements

Pegasus' road to recovery was paved with the efforts of many individuals. Richard Johnson served as her primary trainer, kept photo documentation throughout the entire process of her training and recovery, kept meticulous records on the training process, and served as the editor of this manuscript. The Middle Wilds crew, Sonia Hill, Chris Rickel, Allison Six, and Yuki Yoshikawa, assisted with her daily care and have been essential in the maintenance of her cue conditioning. Middle Wilds supervisor Mike Glover gave his full support to Richard and Sarah as primary and secondary trainers throughout the training process. Many thanks must go to zoo nutritionist Kerri Slifka, who assisted staff with assessing Pegasus' body condition and making the necessary dietary modifications. Finally, a big thank you to the veterinary staff who were so supportive of all our efforts on Pegasus' behalf.

World's Oldest Asian Elephant Lived to be 86 Years Old

The world's oldest Asian elephant (*Elephas maximus*), 86-year-old Lin Wang, holds the record for the oldest of his species held in captivity worldwide. He died at the Taipei Zoo, where he had lived for 50 years, in February of 2003. An autopsy later determined that he died from cardiopulmonary failure. Asian elephants usually live to be about 50-65 years old.

Lin Wang (also known as Grampa Lin Wang) was the Taipei City Zoo's star attraction and was a decorated World War II veteran. Lin Wang had shown signs of frailty after the Lunar New Year moving slowly and eating less. His zookeeper said the elephant had been observed spending unusually long periods of time in the pool by his enclosure, known as the White House, during the week prior to his death.

Lin Wang's extraordinary story began in 1943 when General Sun Li-jen, while a division commander fighting in Burma during the Second World War, obtained him from Japanese prisoners of war his troops had taken captive. At that time, Lin Wang was about 26 years old. He was used for carrying military supplies during the war and was honored later for his contributions to the war effort.



Lin Wang at Taipei Zoo



Lin Wang and General Sun Li-jen, 1947

In 1947 he was transported to Kaohsiung and was transferred to Taipei City Zoo in 1954 where he lived with his long-time companion, Malan. Malan died in October of 2002 at the age of 54 from complications of a malignant tumor on her foot.

Lin Wang's "memorial service" which lasted for several weeks, was visited by tens of thousands of people, many of whom left cards and flowers. Lin Wang was posthumously awarded "Honoray Taipei Citizen" by Taipei mayor Ma Ying-jeou.

"When I was a child, my parents took me to see Lin Wang at the zoo. When I became a father, I took my daughters to see him. We watched him grow old, but he also accompanied us as we grew up," Ma Ying-jeou noted.

The zoo planned to have the body of the pachyderm stuffed and displayed at the zoo, together with a reconstruction of his skeleton, an undertaking that would require around NT\$5 million.

(Source: Taipei Times.com)



Lin Wang and his army comrades in Taiwan

Some Considerations in the Care of an Elderly Red Ruffed Lemur

By Valerie Norquay, Keeper
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Introduction

Lady Red, a Red ruffed lemur (*Varecia variegata rubra*) was born at Duke Primate Centre in April of 1983. She arrived here at Assiniboine Park Zoo in December of 1985. She spent 20 years with her mate and produced a number of offspring. Her last baby was born when Lady Red was 17 years old. Her mate died in August of 2005. Companionship, mobility, pain control for arthritic joints and feeding practices were some of the issues we needed to deal with as Lady Red aged.



Red-ruffed lemur Lady Red

Companionship

When Lady Red's mate died there was an immediate decline in her behaviour. She would not eat; she was extremely nervous and appeared depressed. At that time we felt she needed a companion. There was a partially handicapped Black-and-white ruffed lemur (*Varecia variegata variegata*) being held at the zoo hospital. Zookie has limited use of his hind legs and some neurological problems. The idea was that they could keep each other company and Zookie would benefit from the interaction with the keepers and the public as he is very social. He would also have access to the outside during the warmer seasons.

The lemur enclosure consists of a glass fronted large 'front' area connected to a wire off-exhibit 'middles' which in turn is connected by a slide to a large grassy outside exhibit. We initially introduce the lemurs in September of 05, in the front of the exhibit with keepers present in the enclosure in case of incident. The introduction was defiantly not as smooth as anticipated. As both animals were somewhat compromised we had to be very careful that there were no injuries. Lady Red showed much more aggression then we were expecting. As Zookie was hand-raised he was much more



Black and white-ruffed lemur Zookie

interested in interacting with the keepers in the enclosure then with the other lemur. We quickly realized that this was going to be a much longer process then we had first thought. Although having Zookie in close proximity Lady Red seemed to find her spark. She did not love Zookie, she loved to hate him! She was almost immediately a totally different animal. She was not as nervous, her appetite returned and she was much brighter.

There were many supervised introductions either through the wire in the middles or in the front. We

did not feel that the introductions were successful and eventually a wooden framed, wire mesh cage 6'x3'x3' [1.82m x 0.91m x 0.91m] was constructed in the front of the enclosure. Zookie was kept in the cage and Lady Red in the rest of the enclosure. By always having visual, auditory and olfactory contact they were able to establish a relationship. The aggressive interactions through the wire lessened both in intensity and in occurrence. We started introducing them during the day when we could observe them and by January of 06 they were together all day and soon we decided that they had been successfully introduced. Now they groom each other, sleep together and call together. Having a companion has enhanced both their lives. I believe Lady Red would not have lived much longer after losing her mate if Zookie had not been introduced. We have since then introduced ring-tailed lemurs (*Lemur catta*) to another single Black-and-white ruffed lemur also with positive results

Mobility

Where historically animals would jump from shelf to shelf or from shelf to tree branch to access all parts of the enclosure, we had to make allowances for Zookie's handicap as well as Lady Red's diminished abilities. These took the form of bridges and ramps. Over the last few years these were modified as Lady Red's abilities changed. Last summer we had to remove all the ramps to keep her on one level as she was starting to fall. Rubber mats were installed in the enclosure as well as boxes for her to go into, large pillows for those old bones to sleep on, dog beds, large stuffed animals that the regular visitors donate and a baby pool with leaves. We've even had a twin mattress in there at one time. It may look like a flop house but the lemurs seem to enjoy it. As Zookie still needs to shift we use rubber ropes for him to climb as Lady Red is unable to do so anymore and it keeps her safely on the ground level.

Feeding and pain considerations

When Lady Red appeared to be stiff and sore she was put on glucosamine and omega-3 fatty acids. This combination seemed to work wonders. She was able to move more freely and seemed easier in her body. In the summer of 08 she developed an abscessed tooth. This was treated and it was observed that most of her teeth were worn away. Her food has since then been chopped quite small, the veggies are cooked and her monkey chow is soaked. Her medication is administered in applesauce and she both loves this and it ensures she is taking in fluid and calories. She is also offered water in a water dish as she wasn't able to use the self-waterers any more.

Conclusion

Giving Lady Red a companion was probably the best thing we did for her to increase and enhance her old age. Some of the changes in an older animal are slow and subtle. At the end of the last summer (08) Lady Red wasn't coming in to the inside even when it was starting to cool off. We realised that she was nervous of the ramp and started carrying her in. It wasn't that she didn't want to come in she couldn't. Relief keepers are an invaluable resource as they quite often see things that one keeper misses. Having the summer patrol staff interested in her also gave us an idea of what happens in the evening.

Photos for this article by the author, Valerie Norquay

Collaborative Management and Interpretation of Arthritis in a Geriatric Giraffe:

How communication, training and medical care make a difference in the life of a very special animal at The Maryland Zoo in Baltimore.

By Loren Sobeck, BS - Animal Keeper

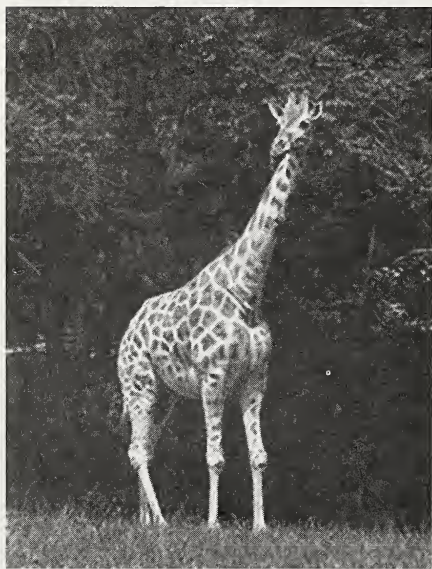
Rebecca Gullott, BS, AAS - Mammal Collections and Conservation Manager

Ellen Bronson, DVM, Dipl. ACZM - Senior Veterinarian

The Maryland Zoo, Baltimore, MD

Caring for older animals is probably one of the most difficult tasks facing a zookeeper. Emotional attachments with animals are often formed and it is difficult to determine what course of action is best to take when severe medical problems develop. With the compassion, knowledge, training, and support of veterinary staff, supervisors, collection managers, and the public, zookeepers are able to do everything possible to ensure the well-being of the animals in their charge.

There are many medical conditions that afflict aging animals, but arthritis is one of the most difficult to deal with from a management standpoint. Arthritis is a disease that can cause pain and loss of movement of the joints. Osteoarthritis, the most common form in geriatric animals and humans, is a chronic condition that affects the joints relied upon for everyday movement. Due to advances in veterinary medicine and husbandry, animals in zoos reach older ages than decades ago and compared to their wild counterparts. As a result arthritis has become a frequent affliction in geriatric zoo animals. All animals at The Maryland Zoo are examined routinely, including radiographic evaluation. Lesions suggestive of arthritis are noted, and animals are often started on oral joint supplements if any signs of decreased mobility, stiffness, or discomfort are noted. If caught early, we have found these oral nutraceuticals to have good if not excellent results in most mammals, including several ruminant species. Despite medications and treatments that are used to help ease the pain and inflammation of the joints, managing the animal is a difficult task for all those involved.



Reticulated Giraffe "Gretchen", age 22 yrs.

Communicating illness and death to the general public can be challenging, especially when animals succumb to conditions that are easily treated in humans. Arthritis in aged animals is an interesting example because it is a condition with which many people are familiar and many even experience first-hand. Our guests may have a greater understanding of the pain associated with chronic arthritis, as well as the lengths people go to treat it, and can perhaps sympathize with animals that also suffer from it. However, it is still necessary to bridge the gap between what it means to be a human with arthritis and what it means to be a zoo animal with arthritis. This is not something that is typically fatal in humans, so what's the big deal in the zoo?

A female reticulated giraffe (*Giraffa camelopardalis reticulata*) named Gretchen, born at the Denver Zoo on 25 May 1986, came to The Maryland Zoo in Baltimore in May of 1987. At three months of age, Gretchen was diagnosed with septic polyarthritis, confirmed by blood and joint cultures, and was successfully treated. Despite treatment, conformation changes were evident at the time of her arrival in Baltimore at one year of age. The changes consisted of valgus deformity at the fetlock in the

front feet (fetlock turned inward, toes turned outward), and the opposite, a varus deformity, of the rear fetlock and toes. As Gretchen grew, she had repeated swelling in multiple joints on all legs and occasional lameness on her left front leg, which was most severely affected. Short courses of non-steroidal anti-inflammatory drugs seemed to help for intermittent episodes of lameness. As Gretchen aged, her conformation issues became more pronounced. Her front toes deviated medially to the point that her outer hooves were becoming very overgrown. From 2001-2003, keepers used operant



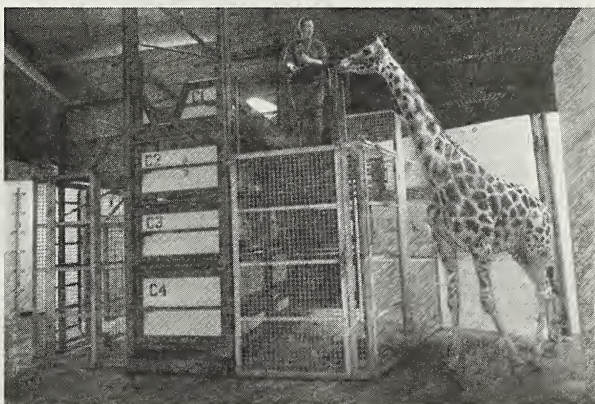
Lifting Gretchen's front left leg for hoof trim



Gretchen receiving hoof trim of front right hoof

conditioning to train Gretchen to stand voluntarily in a chute area without a squeeze device, and to tolerate hoof trims using a hammer and chisel. At the time, lifting of her leg could not be safely accomplished to gain access to the soles of her hooves. However, it is believed that this initial treatment along with intermittent oral pain medication regimens significantly prolonged her life.

In the fall of 2003, The Maryland Zoo in Baltimore acquired a giraffe restraint device (GRD) from Fauna Research, Inc. Gretchen was quickly desensitized to the device that in turn allowed for more in-depth hoof trims of all four feet. With this, came significant progress in correctively trimming her hooves. It was at this time that her rear feet began to deviate progressively as well. The hoof trims continued as needed on all four feet, generally four to six times yearly. She was observed walking more comfortably immediately after the footwork sessions. Gretchen's docile and calm demeanor, strong relationship with keepers and cooperation with training significantly contributed to the successful and extensive care that was able to be provided in the final decade of her life.



Gretchen getting ready to enter GRD

In the last three years of her life, Gretchen shared night housing and exhibit space with three female reticulated giraffe: Mary, age 21, and her two daughters, Zoe, age 12 and Angel, age 10. In February of 2007, Gretchen was reluctant to move

her left rear fetlock joint which was likely the result of an injury from one of the other females. It was at this time that the decision was made to separate Gretchen from the others overnight. She was on a daily pain medication regimen of daily oral and biweekly injectable joint supplements. Oral non-steroidal anti-inflammatory medication was given as needed for pain management, with increasingly higher dosages needed as her condition progressed.

In the fall of 2007, a 15-month-old male, Caesar, was acquired from the Jacksonville Zoo in Florida. It was at this time that staff made the decision to move the second eldest female giraffe, Mary, in with Gretchen overnight for additional companionship. Regular discussions of care, hoof trims, and other treatments for Gretchen continued over the next seven months. Animal care and veterinary staff met frequently to discuss Gretchen's condition. We developed very clear criteria and language to communicate about her health and quality of life. We would talk about what we were each seeing and what that meant for Gretchen to be sure that keepers, managers, and veterinarians were all on the same page with regard to our treatment of this animal with which we were all strongly bonded. The amount of time that she was able to go out to the main exhibit was limited due to its slope and substrate conditions as well as her progressively limited mobility. Hoof trims were becoming shorter

in length because it was increasingly difficult for Gretchen to shift her weight to other legs while the focus leg was held up with ropes. Staff attempted everything possible to make her more comfortable and to help ease her pain, including novel treatments, such as oral gabapentin, an anticonvulsant from human medicine that has been shown to have some efficacy for arthritis pain in dogs and horses. Its use had not been documented for in giraffe or any other ruminant. Acupuncture was also performed multiple times by a licensed human and certified animal acupuncturist. These procedures were performed in the GRD with supervision from our veterinarians, and were well-tolerated by Gretchen, although we observed minimal effect likely due to the severity of her arthritis at the time the treatment was initiated.



Gretchen receiving acupuncture treatment

the lengths we go to provide the best possible husbandry and quality of life for each individual. Part of this is managing chronic illness and death.

Keepers maintained a watchful eye on Gretchen for day-to-day management. She was going through good phases and bad phases. There were days that she was very slow to move between pens and would not transfer out to the main exhibit. She was given extra enrichment, training time, and attention. There were still signs that she was laying down at night to rest which staff regarded as a positive sign that she was comfortable enough to get up and down.

Staff had been managing Gretchen's arthritis for close to a decade. In the spring of 2008, as staff was meeting to discuss Gretchen's condition, we recognized that our efforts were yielding less and less success. Although Gretchen's quality of life was still acceptable, we realized that the most difficult decision was not far ahead of us. We were trying some fairly new treatments to ensure her comfort and thought it was time to share our struggle with the



Gretchen receiving Adequin injection in right hip area

community. Our public relations director contacted a reporter from the most prominent local newspaper with whom we had worked before. She gave him some background on Gretchen's story and invited him to come to observe a routine hoof trimming procedure in the GRD. During the procedure, we told him of Gretchen's history, and all that we had been able to do for her over the years. We were able to demonstrate her gentle personality and explain why she was so adored by Zoo staff and the community. We told the reporter about what it takes to manage an animal with a condition like arthritis and why it is so debilitating to zoo animals, especially ungulates. We described the regular meetings with veterinarians, keepers, supervisors, and curators, during which we discussed any changes in her attitude, interactions with the herd, her posture, how she held her legs, and just about every step she took to be sure she was maintaining a good quality of life. We clearly outlined our parameters for an acceptable quality of life for Gretchen. Euthanasia is a gift to us in the animal world, but it is one of the most difficult gifts to give. We conveyed to the reporter how we determine when it is the right time and how important it is for keepers to know the individual animal and its behavior in order to make these decisions in the best possible interest of the animal. In Gretchen's case, we knew we had only a few months before her quality of life would dip below what we were comfortable with. This reporter wrote a lovely piece highlighting Gretchen and also the difficulties we face with arthritis in zoo animals and about the advances in zoo medicine and animal training that enable us to provide such impeccable care.

It was in May of 2008 that animal care staff and with the veterinarians determined that Gretchen's overall quality of life was no longer acceptable. She seemed to be having more bad days than good. After almost 22 years, Gretchen was having a harder time moving around and didn't move much if she didn't have to. On 24 May 2008, Gretchen was euthanized due to chronic arthritis. She had been a revered member of The Maryland Zoo in Baltimore's collection for 21 years and a favorite of its visitors. Gretchen spent the last day of her life standing regally atop the slope of the giraffe exhibit soaking in the spring sun. As we watched her that day, having already made our decision, we felt reassured that we had done all we could for her, and not waited too long to let her go. If it wasn't for continued cooperation and good communication between animal care and veterinary staff, Gretchen may have departed a long time ago. Gretchen's calm temperament and willingness to train was really what made successful treatment of her condition possible. Her story is a true testament to how amazing animals can be.

When the time came to humanely end Gretchen's life, several news outlets lent a sympathetic ear. There were no questions asking why we couldn't do more or what we could or should have done differently. We believe that we successfully imparted to our community the high level of professionalism and scientific integrity that exists in the zoo field. We conveyed the seriousness with which we take every decision surrounding the care of each animal. Our emotional connection to the animals under our care was obvious. Through this article, our community gained a respect for the work that we do and more importantly, gained a respect for Gretchen and animals like her that serve as ambassadors for their species, fostering appreciation of wildlife and inspiring conservation in all those who gaze upon them.

We'd like to thank all Maryland Zoo staff and volunteers for their continued support of animal care. We'd like to especially thank Public Relations Director, Jane Ballentine, for her assistance with this article.

All photos for this article courtesy of the Maryland Zoo in Baltimore

Indoors Natural Substrates for Elephants & Medical Issues Associated with Hard Surfaces

By Alan Roocroft
Elephant Business, Escondido, CA

(Editor's note: this article originally appeared in the October 2005 issue of *Animal Keepers' Forum*)

Prologue

It is my hope that the information in this article will make us stop for a minute and consider the captive life of the elephant on their terms. Concrete floors that are now commonplace are obsolete and detrimental to elephant health and should be discontinued as the prime inside or outside holding area surfaces. The use of natural substrates will encourage year-round natural behaviors; it will improve sleeping, and encourage digging and dusting, elements that are now lacking, especially in zoos with inclement weather.

Having had the privilege to work with elephants for many years and knowing numerous elephant keepers, I present this information from my own experience. Thus, I hope to present an interesting, well-balanced paper on using the elephant's own biology for its betterment in captivity.

Working with elephants has been an evolutionary process for me. It was made easier over the last 15 years, on an evolutionary perspective, by the fact that I have not had elephants under my direct control; elephants that I was not directly in charge of myself, but I was still maintained by an institution that was locked into a philosophy and old style way of thinking, where elephants were concerned. This position has allowed me to get out of the proverbial historical box when building my futuristic philosophy. It has allowed me to think about elephant management in a different way, to use what I see and learn on my travels in many different countries and cultures in its broadest sense and to the betterment of the elephant in our zoos. My ultimate aim is to disseminate and implement these thoughts, especially to the upcoming young people who may be more flexible of thought, and are not yet locked into the historical perspective of old techniques and are more open to a totally "out of the box" perspective, like sand substrates.

The consideration of indoor substrates is only one of many new concepts that I will present in this and future articles that I am writing concerning better elephant management; some of these ideas are now being implemented in several zoos around the world with whom I work. Twenty-four-hour feeding strategies, "no more hay on the ground", the use of exhibit furniture that encourages and enables natural body movement like kneeling, stretching and climbing behaviors rarely seen in our zoos unless they are a part a show or demonstration to the public are among these ideas. Important aspects for consideration are improvement and utilization of the indoor elephant space and the size of the space allotted. No more square "convenient" angles in wall design and certainly, the use of boring concrete everywhere as the prime interactive surface has run its course. The use of natural interactive surfaces, I feel, is the way of the future and what we will be judged against as elephant housing in our zoos comes under criticism. Much larger and more complex outside enclosures with a 24-hour activity possibility in all weathers and climates is another consideration. We must create places in our zoo environment for elephants to get out of eyesight of one another so that they can be alone, much as they would be in the wild when feeding. This will, of course, demand innovative thinking and the use of thought processes that have never been before offered in the design of new elephant facilities.

In essence, a total rethinking of how elephants are being kept in our zoos will need to be launched. The present industry standards do not meet even basic animal needs; we allow by the existence of these standards extremely poor conditions for elephants in our zoos to continue and, when new enclosures are being created, we spend much money on out-of-date captive elephant environments using the same worn-out ideas.

Close friends and acquaintances working in the field of elephant management, and people that I have been advising in zoos around the world have encouraged me to write this article concerning the use of indoor natural substrates for elephants. It was suggested that I should write about the successes zoos are having with this idea so that the concept would become known and more widely used and accepted.

The comfort of captive elephants has never been a topic that has been comprehensively addressed or fully explored in any great depth by the elephant care community, and by the support or governing organizations such as the USDA (United States Department of Agriculture), the AZA (American Zoological Association) or the EAZA (European Association of Zoos & Aquarium). In fact, their input has been minimal, tending more to avoid the issues rather than address them. The information at workshops, schools and at other elephant keeper get-togethers is usually directed towards the control of the elephant whether it be Free Contact or Protected. Long discussions on the merits of the handling system in operation and the keepers' open defense of their preferred system seem to be more important topics of discussion. I believe that there is rarely a consideration to how the elephant is handling its environment and the confinement we provide. The elephant's natural biology is virtually never a reference or benchmark used to guide captive care. The guidelines and standards we write set the bar so low that it has nothing in common with the elephant's long-term well-being, comfort and health in our zoos.

Keeping captive elephants on natural substrates cannot be a new idea; after all, elephants spend the whole time in nature on surfaces that they can interact with and manipulate, surfaces that move and yield when touched. Thus, why haven't natural yielding substrates been adopted earlier in the history of exhibiting zoo elephants? After speaking to many people, the reasons for not considering sand substrates or deep litter on in-door exhibits, as far as I can determine, has been convenience or in a few cases medical, (cleaning concerns and the fear of colic and not being able to disinfect efficiently).

This paper is a discussion into the reasons and feasibility for keeping zoo elephants on natural surfaces, surfaces with which they can interact and which they can use in their daily lives 24 hours a day, even when keepers are not present. The idea of providing natural substrates is not meant to have any sort of scientific basis attached to it because, quite honestly, what I am suggesting is not science, but merely common sense for animal health and comfort.

Some of the common problems that face zoo elephants are associated with and the direct result of being housed on hard unyielding, cold and continuously draughty and damp surfaces. Arthritis, foot abscesses, pressure sores on cheeks and hips, knee calluses that are sensitive to the touch and swellings at the knee joints, etc, are the direct result of kneeling on concrete floors. I have seen large serum-filled swellings on elephant hips, shoulders and heads that are the direct result of exposure to hard surfaces, even to the point where the elephant will only lie down on one side or in a half-right position to rest.

As an elephant grows older it becomes more inflexible in body as well as in mind, not too different from us. Finding a comfortable sleeping position, for instance, will be a harder task for an older animal when the only surface is a hard flat concrete pad or some other version of hard substance. Although convenience and sometimes medical are the reasons given, I can say for myself that, if someone had come to me with such an idea during my earlier years in elephant management, I would have laughed at the idea in a similar way as I laughed at not chaining elephants at night. We have done it this way for years so why change it? If I couldn't wash the floor, then I was not doing my job correctly. In many ways this is very much like the stereotypical behavior, one that is not uncommon in the elephants for which we care. Today, however, I am convinced that a change in substrates, particularly in cold northern climates or in zoos that use indoor housing at night as a prime holding area even in warm locations, is one of the key elements of keeping elephant's healthy long-term, in a zoo environment.

The turning point in my case to consider the value of natural substrates was the first irreparable foot abscess I had seen, and elephants that wouldn't lie down to sleep at night - which in our zoos are many. I was asked to treat an abscess and then I realized that I could not offer ongoing successful treatment or repair the foot if the elephant continued to be housed in such sterile unyielding conditions.

I was witnessing that abscesses were only the symptoms of a problem, not the actual problem. The elephant's environment and the elephant's abnormal behavior caused by the environment was the *actual* problem. I now believe that abscesses are avoidable. It goes without saying that any foot abscess is a problem in itself but, if left without treatment or a change in environment is not considered, will eventually kill an elephant .

Poor facility and exhibit design, plus the stressful and biological depletion on the elephant from daily routines, all help to develop behavioral problems in captive elephants. Lower stress by lowering the waiting and anticipatory behaviors in your elephants. Examine your daily routines, stop the rocking, provide them with surfaces they can utilize and with which they can interact. Finally, enhance their natural biology, encourage natural tendencies in feeding and sleeping patterns, create good habits in your elephants; only then can you start to repair the foot abscess and divert psychotic behavior.

Hard surfaces, combined with repetitious rocking and swaying behaviors, as well as anticipatory waiting behaviors are the kiss of death for captive elephants. The elephant does not do well when it is left with "down-time", time just waiting for the next thing to happen. Thus, securing your elephants (whether with a gate or chains) in a conveniently cleanable stall at night, one devoid of any stimulation, is the worst kind of "down-time"; chaining only increases the effects of the confinement.

Just so that everyone who reads this article is clear and understands exactly what we are doing and condoning: Elephants spend upwards of 16 out of 24 hours on hard, unyielding, none interactive surfaces, and we can now point to this as playing part of their medical and physical deterioration.

As an interim solution now, many institutions install rubber mats and even go to the great expense of laying down poured materials onto the surfaces in elephant night quarters. These interim solutions in zoos are a result of seeing foot problems or other medical issues in their elephants, or hearing from other institutions that have had medical issues in their elephants. Some zoos are pouring rubber pads because they hear it is the right thing to do, but don't have any reasonable basis other than someone else did it.

To me personally, rubber flooring in prime housing areas is only an uneducated gesture and recognition that the elephant needs a different surface on which to stand, but at the same time there is also a need to hang onto the convenience of cleanable flooring; it has nothing to do with elephant comfort. Rubber flooring does not offer the digging, sleeping position variations, or topography options for older and medically impaired elephants a natural surface would. Some zoos, in a misguided futuristic gesture, have poured the rubber floors onto slopes with undulating areas in the anticipation of needed topography and lying-down options for the elephants. This idea provides only minimum improvement

options at best, and the special needs of each elephant cannot be fully met by this, particularly if the elephants do not use the slopes you provide. As examples of needy elephants I might cite large bulls with tusks, and older females with wrist and knee joint issues or pressure sores on head and hips. An elephant's captive environment must represent a haven, a place where each individual with their idiosyncrasies can relax, and a place where their needs are met and not a place in which they merely survive.

Many different floor types have been tried in the past with minimal success and results. Cobble stones were one of the first. Asphalt, wooden blocks or wooden pallets, tiling, concrete and rubber are all surfaces that have been used to house elephants at one time or



another in the history of zoos. They all have one aspect in common: they are all surfaces that are reasonably convenient to clean and in general terms are relatively cost-effective in upkeep.

We have moved away from elephant facilities like the one in the photo on the previous page, with the new architectural statements that are being presented. We are building captive elephant areas that look like the wild but do not act like the wild. Plastic plants, pour-on rock, bird music, concrete floors all create the idea of what an elephant environment should incorporate. But my question is: Do our new facilities represent anything better for the elephant? Can the elephant enact natural tendencies or do anything it would normally do as an organism? Are we building environments for the elephant's or for ourselves?

In contrast, I have been working with five institutions that, on my recommendation, have installed or are considering installing natural substrates as an alternative to what is being offered at present in the Zoological World.



Beekse Bergen Safari Park in The Netherlands (at left) finished (in 2004) an inside stall for the new African bull Calimerio that arrived from Basel, Switzerland. Calimerio is using the sand area for sleeping while he defecates on the adjacent hard floor where his daily wash routine is performed. This facility was designed with an in-wall heating system.

Amersfoort Zoo, also in The Netherlands, has also provided a natural substrate in one-half of the bull holding house so that he can lie on contoured flooring, enabling him to make a recess for his tusks and large head. The flooring will also be heat-efficient because of its depth. Concrete floors and pipes have an awful way of holding the cold and as an elephant gets older and less agile, they stop lying down and then prefer to lean against the wall instead.



Amersfoort Zoo in The Netherlands co-hosted with Beekse Bergen Safari Park an Elephant Foot Care Workshop in October 2004. A major focus of the workshop was a consideration to natural substrates. The attendees were extremely interested in the amount of effort zoo staff provided their bull Sammy with a new interactive environment everyday.



The Dublin Zoo in Ireland, under the direction of their visionary Director Leo Oosterwegel, is presently considering installing a sand substrate into their new elephant exhibit design. The Dublin Zoo has embraced the idea for the whole inside area of their new facility for all elephants to be a natural substrate, cows included. One of the most convincing factors was that during the summer months in the outside yard Judy, one of Dublin Zoo's two cows, can lie down to sleep on a very large sand mound that the zoo has provided for just that use. After

the new facility has been constructed, Judy will be able to lie down during the winter also in her new improved inside environment.

Judy & Zoe at Chester Zoo



The Chester Zoo in England is to date remodeling their presently very large elephant house and making it even larger and more elephant friendly. The inside will be divided into two areas; a rubber-covered floor for the daily wash routine and the second, in public view, will be sand. The public will be able to observe elephants during the winter months enacting natural behaviors such as digging holes, throwing dirt and, if they are really lucky, they will see an elephant making its bed, pushing their massive heads into the soft substrate

making inclines and topography to find a comfortable resting position. Now this will be truly massive progress and another good example of progressive husbandry for the zoological community worldwide that Chester will be providing. In the 1960's, Mr. George Saul Mottershead, the founder and Director of the Chester Zoo in England, had the wisdom to try a totally new concept that he called "A Zoo without Bars". He was interested in exhibiting animals in open, free viewing areas, free of bars and free from viewing restrictions with many animals at his zoo. Elephants were one of Motty's, as he was affectionately called favorites, and that led him to the open concept for exhibiting elephants. I also believe that philosophically he never agreed with the fact that chaining the elephants was absolutely necessary. Time has proven him right. This decision, of course, put an additional pressure on his then very hands-on staff. The result was the first of its kind, an inside area that allowed a free run for elephants that put distance between them.

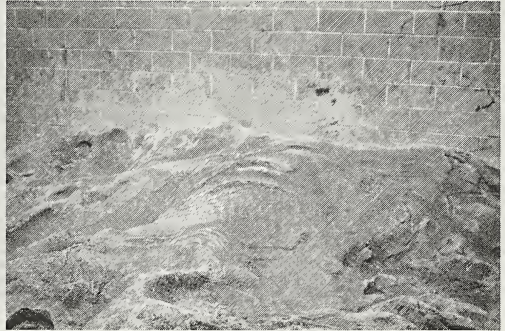


The Roger Williams Park Zoo in Providence, Rhode Island incorporated a sand area for their three African females some time ago. They are now redesigning the elephant house and have decided to enlarge the sand area



and encompass more of the facility which is off public view. The reason for the enlargement of the sand area, and a very positive shift in elephant husbandry and I must say, a considerable monetary investment is quite simple: it benefits the elephants. The zoo staff has carefully observed and evaluated the use of the sand by the elephants and weighed it against how elephants were kept in the past at RWPZOO and also, how they are being kept in other zoos.

The photo to the right shows the inside sand area at RWPZOO where an elephant has laid down to rest at night, using the topography of the ground to support tusks, head, neck and legs as they sleep. Most elephants try to attain a foetal position when sleeping; and the slope of the mound helps older elephants to manoeuvre when getting up.



Disney's Animal Kingdom in Florida has just stated to experiment with sand flooring in one of the stalls for their African elephants. The elephant manager who I was together with on a job at another zoo also saw the wisdom in what I was suggesting and implemented it at his facility. The idea is on the move.

Medical issues and ongoing physical problems that are caused and aggravated by the conventional employment of hard, unyielding and non-interactive surfaces



Medical problems due to living on hard unyielding surfaces, to which elephants have been exposed since being kept in captivity in the west, continues to take an incredible toll on many zoo elephants. Where possible, elephants enjoy rolling, resting and digging in sand piles twenty fours a day, if they are provided. Generally, however, sand piles are provided in zoos on an inconsistent basis and elephants only have access to sand outside but even then many elephant yards are flat and boring with no stimulus value. Sand or natural substrates on indoor areas have not been widely considered at this point. But believe me it's coming.

Tusk wear on concrete flooring has been a big problem for elephants in zoos for many years. Some zoos have even resorted to capping or metal banding the tusks so that tusk contact with the concrete is avoided. This has had mixed success. I have always wondered how mature bulls with large tusks can lie down on a flat level surface to sleep, and as also always wondered when exactly does the time comes that they stop lying down; how does that very moment occur when the animal says to itself: the pain and discomfort of going down and then getting back up again is not worth the benefit of being down. When growing up I always heard that elephants could sleep standing up. That was fascinating to me then like a lot of other elephant mystic. Today I am not so sure how acceptable such a statement has been and what effect it might have had on the health of thousands of zoo and circus elephants that had to sleep standing up because their quarters were inadequate. Elephants

need to rest, they need to take their enormous weight off their large feet, and they cannot do it easily on a flat or hard surface.

Pressure is the worst thing for elephant's feet, particular for older and out-of-condition, overweight and lethargic animals. The lack of muscle tone and abnormal bone development in the legs can only mean that their feet take more abnormal pressure than they would normally take in nature. The skeleton is meant to carry the weight of the body with the help

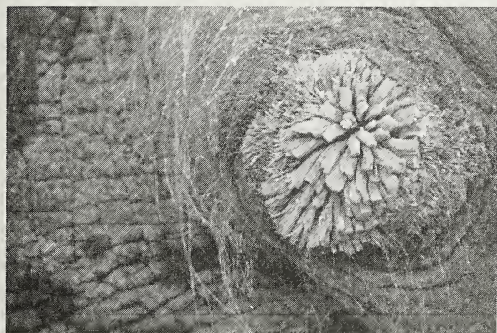
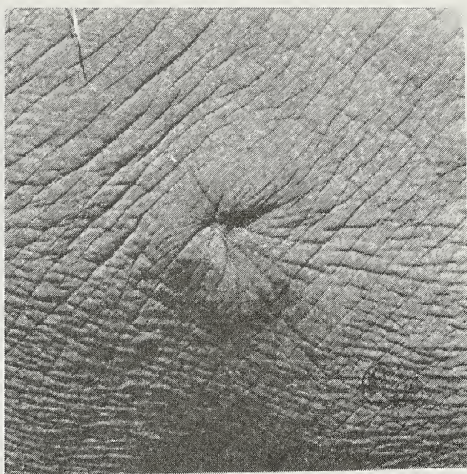
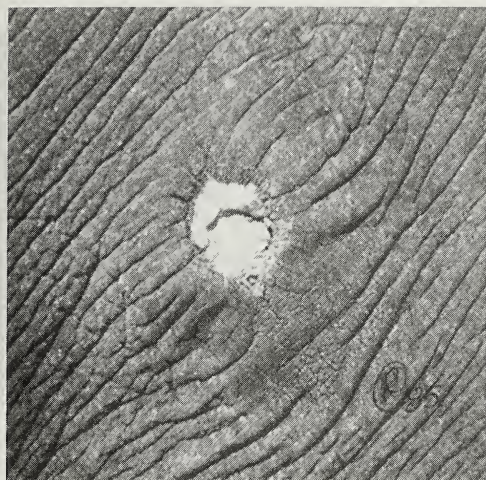
of the muscles but, if the muscles are limp and sagging, then the weight is only going one way - down. Weight distribution in elephants is a 60%-40% split most of the weight being carried over the front feet. If these percentages are disturbed or the elephant is compensating because of a physical abnormality, the percentages will shift creating damaging pressure where other foot and legs joints start carrying the extra weight.



Pressure sores on the hips and temporal areas, large uncomfortable sinus and sensitive spots on the body from lying on concrete floors are common in our captive elephants. This old circus elephant has two very large sinus growths and a small bump above the knee on her left side; she had none on the other side. These sinuses are usually filled with a clear serum and, in my experience, they are benign swellings that cause extreme discomfort to the elephant when touched and will obstruct the elephant from lying on that side, but they have no other medical consequences. If the decision is made to operate, they take a very

long time to heal, and this then leaves an uncomfortable scar making lying down even harder. The sinus itself is better left alone in my opinion if no weeping or drainage is present.

The following photos are of hip sinus that was operated upon whilst the animal was under my care; it took five years to heal. The original hole was 6" square and 4" deep on the initial day of surgery and it was extremely difficult to keep clean. Throughout the healing process, lying down on the left side was out of the question for this animal, at least at first but, as the inside face of the sinus hardened and dried, the elephant would lie down on that side also. This particular sinus developed because of an uncomfortable stall arrangement where she could only lie against the wall of the stall in a half upright position, thus stretching and applying, I believe, abnormal pressure on the left hip and thus causing a sinus at the hip joint to occur.



Elbows and the temporal area of the head are two other areas that suffer tremendously from continual contact, either during mandatory wash or performance routines, or at night when the elephant is trying to find a position to rest on the hard surface of its stall.

When an elephant is in the first stages of joint discomfort and it appears difficult for the animal to attain a stretch position during a routine care, one should alter the daily routine until the underlying nature of the problem has been detected and possibly alleviated. All too often I hear that the animal is “playing with you, she knows how to lie down”. This, of course, could be the wrong answer. Check her kneepads, front and rear; if they are tender to touch, she probably has a pressure sore developing under the hard callous surface of the knee. This type of condition needs time to heal, so all lying down routines should be discontinued until the extent of the damage is known. Every consideration should be given to the animal’s comfort, thus observation is the key. In the photo at right a soft rubber pad was used as an interim solution to soothe a tender knee joint and help the elephant gain confidence in lying down again.



Re-evaluate your routines. The knee joint of an elephant is not meant to be a weight-bearing joint thus the stretch positions where all four knees are on the ground at one time for the elephant to be washed or brushed off is an abnormal position, the half right position is even worst because all of the front body weight is on one knee. Pressure and tissue damage in the knee joints occurs rapidly.

Who has not seen temporal or hip pressure sores on elephants? They are so common in our zoos that, when speaking to young keepers about them, many think it is a normal part of the elephant's physiology, something we should expect with captive elephants. How sad to think that a medical issue caused by inconsistencies in our husbandry practices has reached a level of normalcy. What other inconsistencies and detrimental practices to our elephants in our husbandry have reached a level of normalcy?



An elephant's foot is not designed for continuous contact with hard surfaces. Their feet need an undulating topography and sideward motion that strengthens tendons and ligaments so that the feet grow strong and straight. They need dry sand, sometimes wet sand through which to run their feet on a 24-hour basis. I just recently visited a zoo in the west that had built a brand new elephant complex, the outside yards were so flat it was as if someone had purposely use a laser level on them to get them so flat.

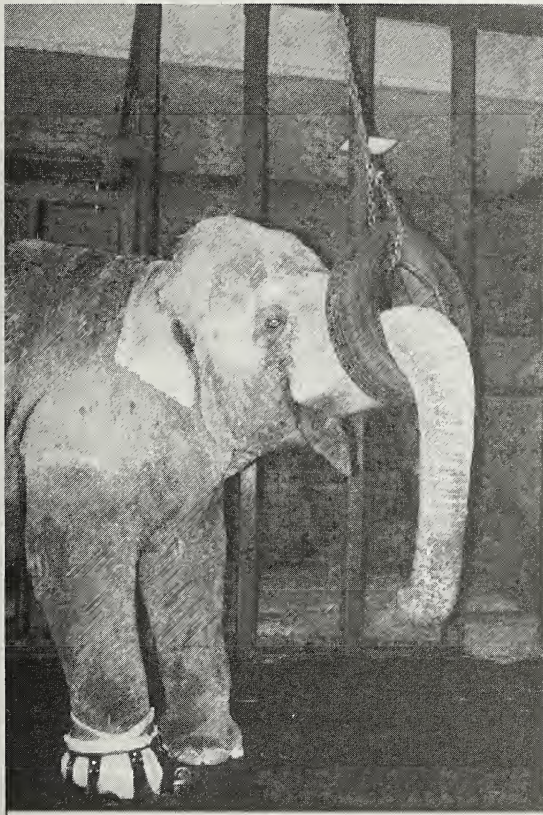
Elephants are not a vehicle or an inanimate object; you cannot just put them away into the garage at night on hold, waiting for the next convenient time to take them out or put them through a control-orientated activity. The elephant has a very distinct and unique biology that needs to be enacted over a 24-hour period. An eight-hour keeper shift means absolutely nothing to an elephant, and the downtime, the 16 hours standing around waiting for the keepers to return is devastating to an elephant's physical and mental well-being.

Pressure to the feet and tissue damage is relatively quick to start and it advances rapidly if not attended to by experts. Below are two examples of abscesses in elephants' feet that, I believe, have their root cause in continual pressure, standing in a confined space and on hard surfaces.



The first photo to the left is an African elephant that was allowed to stand and stereotype in her reasonably large enclosure at a gate for years, plus spending 16 hours in her stall at night on a concrete floor doing the same thing. Eventually, the rocking motion caused irreparable tissue damage in both of her number two nails on her front feet.

The second picture to the right is an extreme case of an abscess in an Asian elephant's left front foot. This animal had abscesses in the other foot also. The environment that this animal lived in for years was totally unsuitable for her biology and consequently, she died from medical issues related (I assume) to her foot conditions.

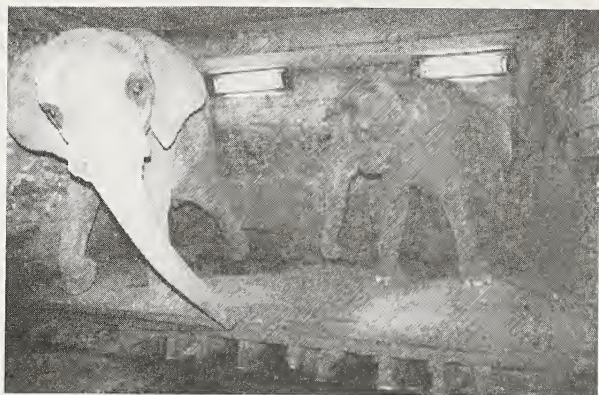


Once an elephant becomes infirm, particularly as far as the feet and joints are concerned, it will decline and deteriorate rapidly. What further impacts the elephant's health and compromises its condition is the fact that it cannot rest adequately. The elephant in this photo at left, in the latter days of its life was provided a tire so that it might at least redistribute some of its body weight in order that its front feet and leg joints could rest.

Please remember, the elephant cannot get away from the environment that we have provided for it.

With access to natural substrates, throughout its whole life, the elephant learns that it can manipulate the sand and use it to its advantage. Leg joints and tendons, feet muscles and ligaments become strong and flexible. Anticipatory and repetitive behaviors that encourage stereotypical motion are greatly reduced if feeding strategies and other behavioral furniture that will enact and encourage natural behaviors are installed along with

sand flooring. Digging, kneeling and lying down on a regular basis, even at night, 24- hours a day, 365 days a year, encourages behaviors in the elephant and instills good habits that the elephant benefits from over the long term of its life in the zoo. Even if a healthy elephant learns that it cannot find a comfortable position in a concrete stall, it will eventually stop lying down because now the elephant knows that it cannot find a comfortable position to rest; it becomes a bodily habit of the elephant and, in essence, the elephant gives up on the process and reverts to the next best possibility, leaning against a wall with its head or sides, causing other problems.



Old-style Elephant Keeping and Housing

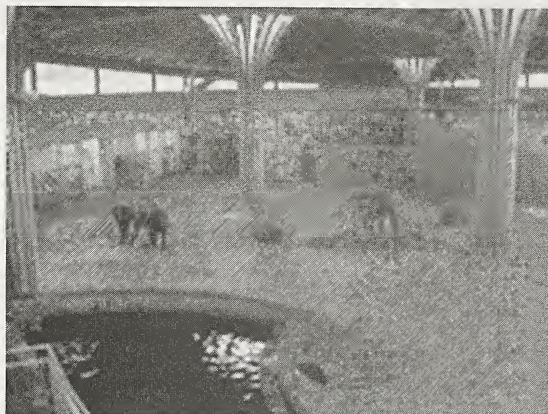
Finding elephants in unfriendly, unhealthy, biology-deprogramming environments is not hard, even in our zoos today worldwide. Old elephant facility design, encouraged unnatural physically-depleting behaviors. Long hour of waiting at doors, chained in one place and constantly pacing until the keepers arrived was and is the norm. We are not so far from that photo at left in our modern zoos even today.

Even though chaining was abolished in many institutions many years ago, the elephant moved its stereotypical habits to another area of the barn, just to stand and rock in a corner or at a door or safe area of the barn. Removing the chains was an easy decision for zoo administrators because it is unnatural for the elephant to be restrained for 16 at night. But what else should we see as demeaning to our captive elephants? I still see huge steps that must be taken in order to bring our zoo elephant management to only a basic level of welfare for the elephant.

New Elephant Facilities with New Ideas

There are, unfortunately, not many zoos at the moment where innovated elephant biological supporting ideas are being implemented.

The present elephant facilities are not elephant-friendly by definition, and it is my opinion that the present designs have a tendency of causing many long-term problems for our elephants, both physically and mentally/socially. Old ideas are dusted off and reinstated; some how it seems to be difficult for the design process to get out of the historical



box in which the zoo community all too often finds itself. Effectively, when a new house is opened to the public for the first time it will be 50 years out-of-date already on the day it is opened. Elephants are still standing on hard unyielding surfaces for long hours in the winter and they eat hay off the ground and stare at concrete walls for long portions of the day, not very different from the way it was years ago. They are standing around for hours, looking at the walls until the keepers arrive, and they all do what they can, wait & cope that is the norm for many of our zoo elephants.

I have to say at this point, and in defense of our zoos knowing the people like I know them, that this is in no way a malicious act or done with malicious intent. The issue of change is so large and overwhelming when dealing with captive elephant management that it is not easy to activate a forward motion that will benefit the elephants long-term. I know and work with many people in our zoos worldwide who would change the situation for elephants if it were within their power. And there are some people who I work for who have, to date, radically changed the lot for elephants in their zoos in a positive way.

The Chester Zoo built a revolutionary open-space elephant building in the 1960's for their then two African bulls and one Asian female. This visionary idea never caught on on a grand scale because



nobody in the elephant community then thought that elephants really needed space, both physical and visual. The zoo community back then, myself included, saw them as a beast of burden whose lack of freedom could be easily justified because thousands in Asia were under the same circumstances.

Another idea that didn't catch on - in the early 80's I was part of a team of people heading up an idea for an elephant reserve and university concept at the San Diego Wild Animal Park in California. I

originated the idea because I was beginning to see tremendously inequity, even back then, in the way elephants were being kept, the way people were being trained, and finally in the way we were meeting our mission - a sustainable elephant populations in captivity. So the idea of creating a large open scope place for free-roaming elephants where young people could come and learn about elephants and their unique management requirements was an attractive proposition, I thought. The idea was simple - bring all elephants that zoos didn't want or couldn't manage anymore and put them in an extremely large facility that could provide the care they need long-term. Give them hilly space they could roam, areas to climb, feeding stations for motivation and productive movement, population numbers that elephants desperately needs to build relationships and bonds with one another. Basically, provide an environment that would reinstate the elephant's natural biology. No elephants were to be brought from the wild as support animals. Each zoo sending an elephant would pay a yearly fee for the upkeep of its elephants. The ultimate goal of the concept was to centralize elephant knowledge and bring in considered experts of the time. I still have the list, from all sectors of elephant management from *in-situ* and *ex-situ* areas. We would start to set a standard of care for elephants that would generate information that would benefit the elephant. We would have called the centre "The Elephant University & Fan of Conservation". The centre and spawning organizations would have been designed over the next hundred years to create a sustainable population of elephants in the USA and Europe from the then biologically-dysfunctional elephants already in zoos. One not-so-feasible aspect of the centre would have been the attempt to reintroduce elephants into a selected location; managed and funded by our zoos both AZA & EAZA in Asia that would have been our contribution to the future of elephant's worldwide. Possibly, if we would have implemented the idea in the 80's, our elephant management would have been a huge step ahead right now, and we would have accumulated much more information on the importance of social structures and herd dynamics; and perhaps been able to avoid all the criticism that the AZA is under for the inadequate welfare of the elephant. That was over 20years ago and, although we started the process of concept building and facility design, the idea fell on deaf ears when we started to talk about money and the all people involved did not have the essence needed to see such a visionary project to fruition.

In conclusion then, for far too many years we have centered on the convenience of elephant keeping by maintaining them like a bus in the depot when not in use. Cleaning the barn took precedent over many of the important elephant's biological needs. Moreover, for reasons of the always-present looming cost of elephant programs, we have never focused on the elephant's basic comfort as an organism, often putting available funds more into interpretation and visuals for the public. Elephants are locked up in small stalls for long hours - often at extremely low temperatures - not even being able to relieve an itch on their backs on the round metals bars of the stall.

Why don't we let them throw sand over their backs in the early hours of the morning or obtain a trunk-full of food hanging high and barely in reach. Elephants have wonderful natural abilities that we could show to our zoo guests and which create an enriching zoo experience if they are planned correctly.

Use the elephant's biology as your reference when considering their captive care and work from the elephant outward. If there is anything on your elephant program or institutional priority list that has a higher priority than elephant welfare, the elephants are ultimately not the main focus and we as a community will face the continuous and ongoing challenge of how to justify our poor successes at exhibiting elephants in our zoos.

Acknowledgements

My sincere appreciation and thanks go to the following people who have influenced, encouraged and helped me with my ideas to introduce innovative husbandry to captive elephants, some have already implemented or are seriously considering the implementation of my ideas at their institutions. My hat is off to you all.

Mario Hoedemaker, Amserfoort Zoo, The Netherlands.

Bas Aalders, Amserfoort Zoo, The Netherlands.

Elephant Keepers, Amserfoort Zoo, The Netherlands.

Wim Verberkmoes, Beekse Bergen Safari, The Netherlands.

Elephant Keepers, Beekse Bergen Safari Park, The Netherlands.

Mark Pilgrim, Chester Zoo, England.

Mick Jones Chester Zoo, England.

Elephant Keepers Chester Zoo, England.

Jack Mulvena, Roger Williams Park Zoo, Rhode Island, USA.

Pat Sharkey, Roger Williams Park Zoo, Rhode Island, USA.

Jennifer Warmbold, Roger Williams Park Zoo, Rhode Island, USA.

Elephant keepers Roger Williams Park Zoo, Rhode Island, USA.

David Tidwell Architects to Roger Williams Park Zoo, Rhode Island, USA.

Geoff Hall, Phoenix Zoo, Arizona, USA.

Dr. Kevin Wright, Phoenix Zoo, Arizona, USA.

Heather Wright, Phoenix Zoo, Arizona, USA.

Elephant keepers, Phoenix Zoo, Arizona, USA.

Leo Oosterweghal, Dublin Zoo, Ireland.

Photography credits: Mike Hudon, Doris Sorby, and Alan Roocroft

Old Bears, New Care

*By Julie Christie and Nicole Nicassio-Hiskey
Oregon Zoo, Marine Life Department
Portland, Oregon*

The Oregon Zoo exhibits 1.2 polar bears (*Ursus maritimus*) 22 to 23 years of age. Over the past three years all three bears have shown increased signs of various health ailments including renal failure, pyoderma, conjunctivitis, allergies, arthritis and various infections. This paper will discuss the early signs, symptoms, testing, diagnoses and medical care given by both the keepers and the veterinary staff. Topics will include how staff incorporated changes to improve the care and management of the collection.

The Oregon Zoo houses 1.2 polar bears (*Ursus maritimus*) between the ages of 22 and 23 years. All three bears were born in captivity and have lived at the Oregon Zoo for the majority of their lives. With the bears' increased age, Marine Life staff noticed increased health problems. This paper will discuss early signs, symptoms, testing, diagnoses and medical care given by both the keepers and the veterinary staff. Topics will include how staff incorporated changes to improve the care and management of the collection.

Conrad, the zoo's only male polar bear is currently 23 years of age. Over the past two to three years staff noticed repeat occurrences of increased lethargy paired with conjunctivitis (inflammation of the membrane of the eye) throughout different periods of the year. Staff monitored him closely during these periods only to see him improve and return to normal after a few days. In September of 2007, Conrad slipped into an extended lethargic state. His lethargy was accompanied by red, swollen conjunctiva, lying in unusual positions, low moaning and no appetite. Veterinarians were consulted and keepers immediately checked for any previous changes or additions made to the exhibit which could explain Conrad's behavior. During this time, staff removed all browse, logs, natural bedding, newer disinfectants and certain food items staff felt may have contributed to Conrad's illness. It was noted Conrad would show signs of improvement only to slip back into a lethargic state. Due to his two to three year history of lethargic behavior, staff discussed possible actions with the vet staff. After monitoring his behavior for a period of time, Conrad did not improve. His appetite continued to decrease, his motivation stayed low and his eyes continued to look red and swollen. Staff also noticed his attitude was more aggressive and grumpy unlike previous years. Keepers tried swabbing and flushing his eyes with saline to offer relief, but Conrad appeared to be uncomfortable during these procedures. Positive results were not seen so these treatments were discontinued.

After weeks of showing symptoms, Conrad was scheduled for a full physical. Several tests were run including: ultrasound, blood collection, urine and fecal collection and biopsies of his conjunctiva and liver. The physical showed Conrad had arthritis (previously known), gingivitis, a low-grade bacterial infection in the liver and blood values which indicated possible hypothyroidism. There is limited information of normal reference ranges for free T4 in polar bears. The vet staff compared free T4 values with two other healthy bears. Conrad's T4 range was much lower than both.

Several medical treatments were pursued. Conrad began receiving Doxycyclene for his liver infection. This treatment lasted for one month. He also began treatment for his suspected hypothyroidism.

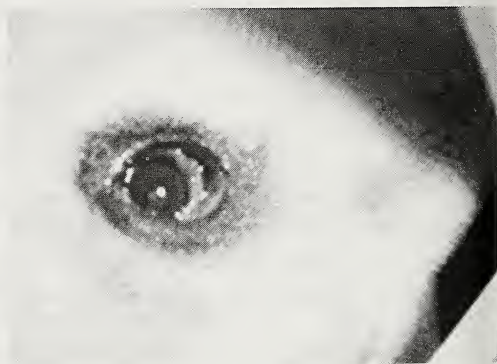
The keepers monitored changes in his activity level, his weight and appetite. Conrad began taking Levothyroxine (Soloxine), (.01 mg/kg BID for 42 days) for hypothyroidism. Keepers noted an immediate change in Conrad. He was extremely active and he had an increase in appetite, even considering the time of year. Staff also noticed a decrease in the redness and swelling of the conjunctiva. The dose was then decreased to .01 mg/kg SID for 14 days. Conrad continued to remain very active and began losing weight. Vet staff re-evaluated the dosage and decreased the Levothyroxine to .005 mg/kg SID for seven days. Conrad's activity and appetite levels returned to a more normal state. Since there is some controversy in treating hypothyroidism and there is a lack



Conrad getting drops to treat his conjunctiva.

of understanding of seasonal variations in polar bear thyroid functions, veterinary staff speculated Conrad may not need to be treated year-round. Vet staff and keepers discussed weaning Conrad off medication completely to see if his behavior and appetite would remain stable. Conrad relapsed about 10 days after the last dose. This change was monitored for a short time and then the veterinarians re-administered Levothyroxine at the lowest dose. Keepers began to see positive effects within the week. Dosages were determined by using a conservative canine dosage (starting canine dosage is 0.022 mg/kg BID).

Much of the training and care for Conrad included; maintaining his scale behavior, training for voluntary injections and for voluntary eye treatments. He was desensitized for eye tactile with cotton swabs, eye flushes, eye drops and ointment and an eye exam with a light. Not knowing what to anticipate with treatment, staff crate-trained Conrad so keepers could gain closer access. Today, staff continues to monitor Conrad's appetite, activity level and weight. Conrad continues on a low dose of 0.0025 mg/kg Levothyroxine. At times, he still experiences some redness with his conjunctiva.



Close-up of Conrad's eye as it shows improvment following treatment.

During breeding season (mid-March to end of May), our two female bears have to be separated. Yugyan is the dominant female throughout most of the year but during breeding season staff sees a shift and Tasul becomes dominant. This shift causes stress to Yugyan. She begins avoiding the other bears, she paces at a fast rate, and she stops eating around the other bears. The two females will often begin fighting. During the six to eight week separation, Yugyan does retain her dominance with the male so is rotated in with him each day. Yugyan, our 22-year-old female, began to exhibit odd behavior last June. Based on their behavior, staff originally thought the bears were undergoing

an extremely long breeding season. The shift in dominance did not return to normal and staff was unable to reunite Yugyan with Tasul. During this period, staff began noticing subtle behavior changes with Yugyan. She continued to avoid the other bears, she paced for prolonged periods and she appeared stressed. She also started showing food preferences for items she typically ate year round. Keepers did note that many of these changes can coincide with breeding season. Then staff began noticing even more physical changes with Yugyan. She frequently urinated and her urine was strong smelling. She began occasionally vomiting; she had an inability to maintain her weight and at times was lethargic. Her eyes appeared weepy and eventually her urine contained visual traces of blood.

Yugyan was scheduled for a physical. Veterinary staff and ultrasound specialists performed a vulva exam, an abdominal ultrasound, a liver biopsy, bile aspiration, and an endoscopic exam along with blood and urine collection. Test results diagnosed Yugyan with pyoderma in the vaginal region and a urinary tract infection. Her chemistry panel indicated abnormalities in her liver and kidneys and



0.1 Yugyan, a 22-year-old polar bear lived at the Oregon Zoo until her death in August of 2008.

her creatine and BUN values were elevated. Her liver enzymes showed possible inflammation involving her bile duct system and her urine was dilute. All of these findings indicated renal failure. Yugyan was immediately placed on oral antibiotics (Amoxicillin[®]) for one month for the urinary tract infection and possible liver infection. She also received Marbofloxacin (Zeniquin[®]) for her weepy eyes. Her urine was retested after her urinary tract infection cleared and the values confirmed she was in renal failure. Veterinary staff expects she is operating on 25% or less of one kidney.

To accommodate for renal failure, the chow portion of her diet was switched from Polar Chow to a Renal Dog Chow. Staff limited certain enrichments items high in protein (peanut butter, cheese, etc.) while offering additional low-protein food items (monkey fiber sticks, cereals, etc.) to increase her caloric intake. To insure Yugyan was always well hydrated, staff began offering her juice several times a day. To treat her pyoderma, staff began training Yugyan to walk into a large crate. One keeper fed her while another applied a Nolvasan[®] solution to her vaginal area. Because Yugyan also suffers from arthritis in her joints, most of her training was modified to accommodate



Yugyan was crate-trained to facilitate vaginal swabbing

for this. The Oregon Zoo has three polar bear exhibits, nine holding areas one squeeze cage and one large transport crate available. This enables staff various training opportunities as well as ease when shifting the bears. Staff maintains cooperative feedings with the bears and has set strict protocols to identify stress so Yugyan is managed appropriately during difficult times. Today, Yugyan has been fully re-introduced with the other two bears. She has playful days but does rest more frequently. Her diet still consists of renal chow, juice and most currently one cup of cod liver oil.

Tasul, our 23-year-old female polar bear, has always had a history of hair loss. The severity of hair loss and skin irritation varies each year but seems worse in the spring. Initial noninvasive treatments were tried beginning in 1998 and included; dietary supplements of cod liver oil, diet-derm, vitamin A and anti-histamines. Results of these treatments were inconsistent. In 2000, Tasul went through a series of intra-dermal skin tests and was found to be allergic to over 50 non-food items.



0.1 polar bear Tasul at the Oregon Zoo

In 2001, Tasul began exhibiting periods of lameness. She was often seen limping and sitting in odd positions. Initially this was attributed to her gait; Tasul has shorter rear legs which causes her to walk oddly. Tasul was also thought to have arthritis. Three years later, chronic foot abscesses began appearing paired with increased lameness, paw biting and licking. Although all four of her feet were affected, her rear feet were especially bad. As a precautionary step keepers removed items in the exhibit which could be the cause of her foot abscesses. These items included a



Foot abscesses caused lameness in Tasul. Above photo shows her paw prior to treatment. Photo at bottom left show the paw much improved.



street sweeper brush, natural bedding, wood pieces, bone shards, and sharp plastic, damaged toys. All of these items were slowly re-introduced one at a time to monitor their safety. Staff also allowed the bears to have access to the dry dens to help with the issues of chronic, wet feet.

Various substrates with different textures like carwash strips, large bolted logs and burlap sacks were given for rubbing and drying.

Tasul underwent a second dermatology evaluation and received biopsies, skin scrapes, cultures, x-rays and blood collection. Upon examination, all of Tasul's feet were red, raw, inflamed and infected. It was determined her allergies were the reason for her abscesses and foot problems. In order to gain better visual access of Tasul's feet, they were shaved during anesthesia. Staff also hoped having her feet shaved would help dry them out. To clean and disinfect her feet, Silvadine and Malaseb packs were placed between each digit during anesthesia.

It was obvious a more aggressive approach was needed to treat Tasul's allergies. Veterinary staff placed Tasul on 12.06 mg of Clemastine BID. Keeper staff began training Tasul to enter a soak tub attached to the inside of a squeeze cage. While in the tub, she received foot soak treatments with dilute Nolvasan[®] three times a week for 15 minute sessions. The Nolvasan was used until a more appropriate medication could be found. Dr. Therese Demanuelle, the consulting dermatologist, suggested using Malaseb and generously donated the expensive medication for Tasul's regular soak treatments. To prevent Malaseb waste, Tasul was later re-trained to accept the Malaseb to be sprayed onto her feet. Other behaviors Tasul was trained included; foot tactile, flash light desense and accepting a hair dryer on the feet. Staff also trained Tasul for voluntary allergy injections. Her allergy injections are now on a maintenance schedule and she receives two injections every other week. Today, Tasul's feet are fully healed and we have not seen an abscess since February of 2006. Tasul still receives Clemastine BID and Malaseb foot sprays three times a week along with her two injections. To date her hair loss has decreased and the Oregon Zoo bears are now participating in a research project to better understand hormones and alopecia (hair loss).

Acknowledgements

Special thanks to the Marine Life Department, Veterinary Department and Living Collection managers at the Oregon Zoo and consulting dermatologist Dr. Therese DeManuelle.

Photo credits: Michael Durham, Carli Davidson and Nicole Nicassio-Hiskey.

UPDATE as of 2009:

Conrad (24yrs) continues on his Cosequin[®] for arthritis and soloxine for his possible thyroid condition. He has also started on carprofen and amantadine for arthritis. These medications have seemed to alleviate pain and increase mobility. We are also training him to receive Adequan[®] injections; this is another form of arthritis medication.

Tasul (24yrs) continues on her two allergy injections every other week. She receives the Malaseb foot spray 3x's a week for allergies. She continues on Cosequin[®] daily and has been taken off her low dose of clemastine (allergies). Her skin problems on her feet remain controlled.

Unfortunately, Yugyan (22yrs) died in August of 2008. Her food consumption had decreased dramatically. She became very finicky and we tried to maintain her weight and fluid consumption. A final attempt was made at anesthetizing and administering a large amount of fluids to try and flush her system. She did not bounce back similar to previous attempts and the decision was made to euthanize her. This was a great loss, but we learned a great deal about geriatric care along with kidney failure care.

Improving the Quality of Life for Tiffany, a 40-Year-Old Female Western Lowland Gorilla (*Gorilla g. gorilla*) at the Topeka Zoo

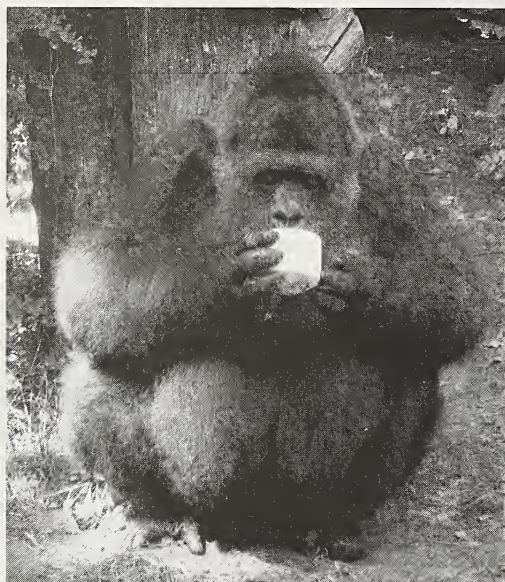
*By Joe Hood, Primary Gorilla Keeper
Topeka Zoo, Topeka, Kansas*

Tiffany was born on 15 July 1968 at the Kansas City Zoo. She was hand-raised for 15 months before arriving at the Topeka Zoo on 15 October 1969. She was brought to the zoo as a mate for Max, born at the Dallas Zoo on 7 March 1969. Max arrived at the Topeka Zoo on 29 September 1969. Max and Tiffany were the first gorillas in Kansas. Tiffany was first housed in the Animals and Man building in a glass-fronted exhibit. This building also housed hippopotamuses, elephants, giraffes, and orangutans. The gorillas and orangutans were eventually moved to the newly constructed Discovering Apes building in 1981. The Discovering Apes Gorilla Encounter exhibit was opened in 1985.



A young Tiffany in the east yard of Gorilla Encounter. (Photo by Kevin Mollahan)

Tiffany celebrated her 40th birthday last July. Overall, she is in good health, but certain aspects of the aging process have required some adjustments in her care. One byproduct of aging is a decrease in zinc, causing skin



Tiffany enjoys a treat on her 40th birthday
(Photo by Kevin Mollahan)

problems in the aging adult. To prevent such problems, Tiffany is given 50 mg of zinc daily. Another adjustment in her care pertains to exhibit access. The weather in Kansas can be quite extreme, reaching highs in the 90's in the summer and lows in the single digits in the winter. The gorillas' exhibit is an outdoor exhibit. Their minimum temperature to be locked on the exhibit is 40°F [4.44°C]. A few years ago we noticed that Tiffany did not seem to be tolerating the cold as well as she had in previous winters. The decision was made to increase her minimum temperature to 45°F [7.22°C]. As she has aged, we have become more liberal with her guidelines. She still goes out at 45°F, but is given access to holding if she seems to be having difficulties due to the cold. She seems to tolerate the heat in the summers with minimal problems. The maximum temperature before giving the gorillas access to holding is 85°F [29.44°C], but if Tiffany needs access at a lower temperature, then we accommodate that need.

In September 2007, Tiffany's mobility showed a drastic decrease. An exam was performed in October of that year, which included an MRI, a cardiac ultrasound, and a gynecological exam. Tiffany was diagnosed with spondylosis of the lumbar region of her back resulting in spinal stenosis. Spondylosis, also referred to as spinal osteoarthritis, is a degenerative disorder that may cause loss of normal spinal structure and function. Aging is the primary cause of this disorder. Spinal stenosis is a narrowing of the spine. This narrowing can cause multiple symptoms. Two of the main symptoms we've seen in Tiffany are decreased mobility and incontinence. Many of the adjustments in her care pertain to these symptoms. When she was first diagnosed, Tiffany was given ibuprofen for pain and inflammation. Over time her mobility improved. The ibuprofen was discontinued due to gastrointestinal side effects. Since that time, her condition has been managed with no pain medication necessary. She is given 900 mg of Cosamin® daily for her overall joint health, which has seemed to help her mobility. Cosamin® is a combination of chondroitin and glucosamine. We have also found it necessary to separate Tiffany from M'bili, the zoo's 17-year-old male gorilla.

The gorillas' exhibit is comprised of two yards, separated by a public viewing tunnel. The gorillas have free access to climb back and forth over the tunnel. The holding units are accessed through the larger west yard. The only way to access the smaller east yard is to climb over the tunnel. In her younger years, Tiffany spent quite a bit of time in the east yard and on top of the tunnel rockwork. Since she was diagnosed with spondylosis, she spends all of her time in the west yard. We used to scatter her diet and enrichment throughout the west yard, on the tunnel rockwork, and even sometimes in the east yard. Due to her decreased mobility, we now place all of her food and enrichment in one area of the west yard when she is on exhibit. We have also restricted access to the moat running along the west yard with hotwire. The moat has a ladder built into the wall that leads into the gorilla exhibit. In the past, Tiffany would sometimes climb down this ladder into the moat and then use the ladder to climb back out. We restricted her access to ensure that she doesn't injure herself trying to climb in and out of the moat or get down into the moat and not be able to get back out. We have also had to make some adjustments when she is in her holding units. For instance, we feed part of her

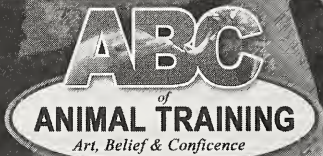


Tiffany in west yard of Gorilla Encounter

(Photo by Kevin Mollahan)

diet during the day down a feedchute from the floor above her unit. The other apes can climb up and retrieve their food out of the feedchute. We have to make sure and push all of her food through the feedchute because she doesn't climb up to get it. The gorillas are given barrels and/or boomer spools to sit on in their units. For Tiffany, we make sure she has either a boomer spool or one of the smaller barrels because we have seen her struggling when trying to climb onto the larger barrels.

Incontinence is another issue we have addressed when Tiffany is in her holding units. Her incontinence is mostly urinary, but she does sometimes show fecal incontinence.



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ENROLL TODAY! SPACES ARE LIMITED!

In the past, we sometimes used shredded paper for bedding. Now we give Tiffany shredded paper only for enrichment. Her bedding is primarily brome because it keeps her dry better than the paper. She used to get 2-3 flakes of bedding. Now she gets 4-5 flakes. We always save some of her bedding until late afternoon so she has dry bedding for overnight. We also leave one of her units empty during the day so she has a clean unit for overnight. We have also had to increase disinfection due to her incontinence. The gorilla holding units and exhibit are disinfected every other day on an alternating schedule. Tiffany's units and the exhibit, when Tiffany has had access to it, are disinfected more often if necessary. Tiffany has a large black rubber tub that she takes with her from unit to unit to sit in. She places clean bedding in it, and as the bedding gets wet, she adds clean bedding to it. Most of the toys in the units are hosed daily and disinfected weekly. Tiffany's tub is bleached whenever she will leave it for us to clean.

Although Tiffany is healthy overall, she has been affected by the normal aging process. Adjustments have been made in her care to

address these aging issues. Tiffany has been an integral part of the Topeka Zoo since her arrival almost 40 years ago. All of the changes in her care have been made to improve her quality of life, and we will continue to do all we can to give her the best life possible as she continues to age.

Topeka Zoo's long-lived Hippo Duo

The Topeka Zoological Park, Topeka, Ks has exhibited two females Nile hippopotamus (*Hippopotamus amphibius*) since the mid 1960's. In 2006, Submarie died at the age of 53. This left Peka Sue as the only survivor of this original hippo duo. Peka Sue was born at the Kansas City Zoo in 1961 and came to live at the Topeka Zoo in 1966. She came to Topeka through the Operation Noah's Ark Campaign

through which people saved soup can labels and bread wrappers that were redeemed for funds to bring animals to the zoo.



Former Zoo Director Gary K. Clarke (then a keeper at the K.S. Zoo) said Peka Sue earned the nickname of "the hesitant hippo" during the transfer. When she was being moved from Kansas City to the Topeka Zoo she put her head inside the transport crate, lying down with the rest of her body outside of the crate. The zoo staff worked throughout the next two days to get her to move into the crate but to no avail. On the third day staff placed marshmallows inside of the crate to lure her in and it worked. Peka Sue died in February 2009 at 47 years of age. A hippos' normal lifespan in captivity is 45-50 years.

Ode to the Oldies:

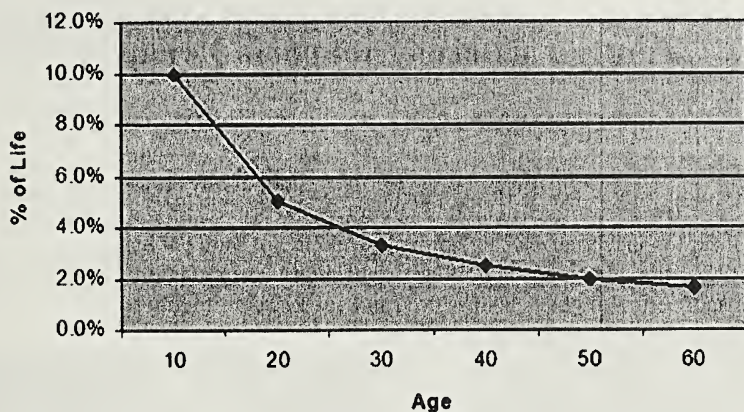
Geriatric Keepers Caring for Geriatric Critters

By Linda Beverly, Marine Mammal Trainer
Indianapolis zoo, Indianapolis, IN
(Adapted from Multimedia Presentation)

The early 1930's opened the door to our current profession. Seventy years of professional marine mammal training has brought greater knowledge, resulting in a greater quality of life for all marine mammals. With the passing of time, we see our professionals and our collections aging. We have become intrinsically linked with our animals; their gains are our gains; their losses are our losses. The emotional drain on all involved is palpable. While "pain is inevitable, misery is optional." (Richard Edler) An ancient proverb states, "A cheerful heart is good medicine, but a crushed spirit dries up the bones." (Proverbs 22:17) Let's share a few medicinal moments to cheer our hearts and refresh our spirits.

So the ole grey mare ain't what she used to be. Neither are you! It happens to the best of us. Life speeds by as the years become shorter. The chart illustrates that at age ten; one year is equal to 10% of our life. By age 60, that has dropped to about 2%. We lose the very things we wish to keep ...teeth, vision, hearing, hair and...uh, oh memory. We keep what we desperately what to lose, like pounds; and acquire things we were never intend to have, such as moles and hair growing in the most inappropriate places.

Year as % of Life



We observe similar ailments affecting both keepers and critters. Mobility is slowly becoming a thing of the past as our get up and go has gotten up and went. Fortunately, we don't see ourselves and our awkwardness, simply because we don't see so well either. Snapper a mature sea lion and Linus a mature grey seal are fighting blindness as age progresses. Likewise, we struggle with vision loss. Blood draws can be quite challenging when you can't see the veins...or the rest of the dolphin.

Hearing, too, becomes a challenge. S^ds [training cues] for aging staff is becoming a new art form similar to American Sign Language. The audience never clues in that we are actually talking to each other. They think it is all dolphinese.

Other effects of aging include the loss of equilibrium, pigmentations changes and difficulty thermo regulating. Thermo regulating is the trainer's term; otherwise known to include hot flashes to any

premenopausal women. A hot flash in a wetsuit is an experience! For those who have never experienced a hot flash, imagine wearing a wetsuit full of pins and needles while sweating a river.

The floor gets lower with each passing year. My co-workers make fun of me as I get ready for shows. When I sit down, I do everything possible below the waist while I'm down. It's my contribution to energy conservation.

Fading cognitive functions means learning new tasks do not simply have a learning curve, but rather a learning cliff. All these losses lead to emotional issues of self-doubt and grieving the loss of what I once was.

In an era that values "all natural", aging is not on the list. I am grateful for the medical breakthroughs that keep man and beast mobile and active. However, replacement parts are not as good as the original equipment. Eye drops help but don't heal. Glasses clear vision...most of the time; except when cold air meets hot air leaving you in a fog. Multiple lenses are wonderful once you get used to them and as long



Author suiting up for tank duty.

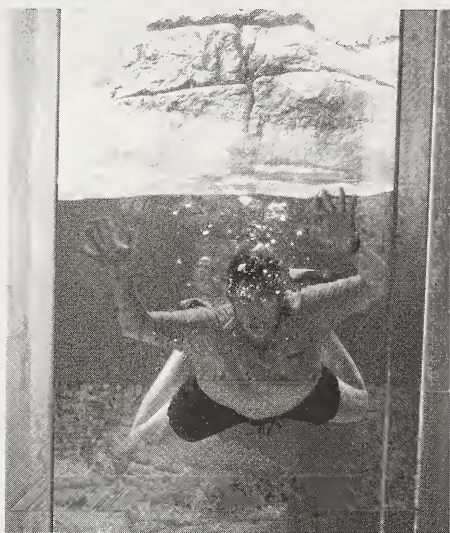
(Photo by Megan Gregory)

as you
are not

working upside-down. Hearing can be augmented by gadgets, mobility by meds and exercise.

We have found hydro therapy extremely helpful for Tahtsa, our 33-year-old polar bear. What's good for the critter ought to be good for the keeper. Like most workout programs, they work better with a friend. This not only increases motivation but also intensity. However, we have found the hazard of swimming with our polar bears far out weighs any therapeutic benefit.

Equilibrium awareness means choosing your behaviors and your path carefully. Doing a pirouette prior to going over a narrow crossover gate is not recommended. Memory lapses rely on lists and learning patterns and routines to keep it simple. One consistent pattern I have noticed is that I usually find what I am searching for in the last place I



Underwater Action

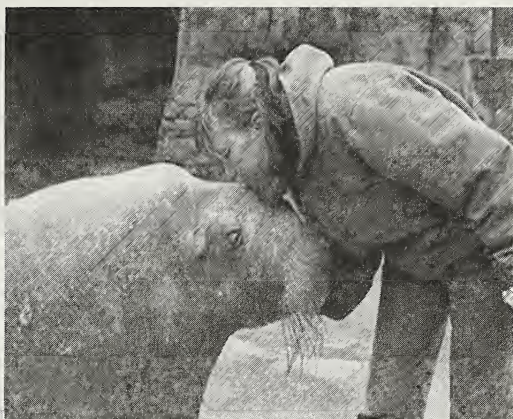
(Photo by Megan Gregory)

look. That may be one the greatest adaptations to aging; not taking yourself too seriously.

Finding balance is one of the advantages of aging. Understanding personal limitations helps to know when it is necessary to push and when it is time to give it a rest. This also transfers to empathizing with the critters in our care. Is it time to push Tahtsa out to swim, or do we need to give her a day inside to rest?

Personal life experience gives insight in dealing with life's struggles. Events are less traumatic as you understand that life is what happens while you are making your plans. Age teaches us to take

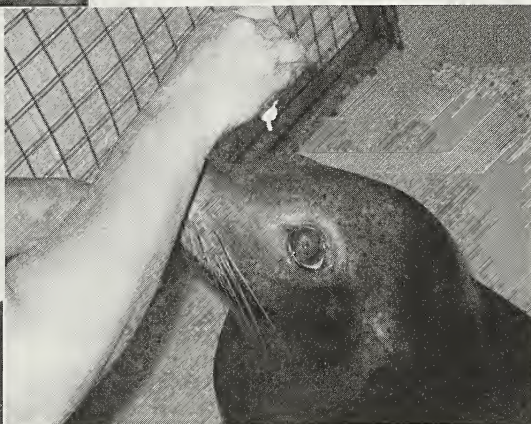
***Aging brings physical
challenges to both
the Keeper and the Kept***



Linda and Brutus
(Photo by Megan Gregory)



All fogged up
(Photo by Megan Gregory)



**Seal lion Snapper gets eyedrops to
ease his progressive blindness.**
(Photo by Linda Beverly)



**Polar Bear Tahtsa gets hydrotherapy
to ease aching joints.**
(Photo by Laura Lynch)

life in stride; it gives confidence to help cope with life's storms. Older animals that have experienced change find it less traumatic as they realize they have survived change before.

Indeed, age teaches that "pain is inevitable, but misery is optional". Pain and pleasure are two sides of the same coin. For each loss, we learn there will be gain. For each hurt, there can be healing. For each sadness, there will once again be joy.

The human advantage is one of introspection. Aging is inevitable, but maturity is optional. Am I growing up, or just growing old? Do I inspire those around me, or do those around me wish I would retire? Human and animal interactions either influence positively or negatively, they are never neutral.

Am I humbly passing on my passions and influencing for a greater good? Humility is not thinking less of yourself; it is not thinking of yourself at all. Albert Schweitzer observed "The only really happy people are those who have learned how to serve."

To the first generation of marine mammal trainers we owe a huge debt of gratitude for their vision and perseverance. We are living in their legacy. To the current generation of trainers at the helm of the industry leading the way in education, research and conservation; what will your legacy be? While teaching the technical skills of the trade are you modeling the character skills necessary to

**Your direction,
not your intention,
determines your
destination.**
-Andy Stanley

build bridges and teams that will make significant impacts on society as a whole and on our animals in particular? Integrity and humility are your greatest teaching tools.

To the next generations of trainers, "your direction, not your intention, determines your destination." (Andy Stanley) You will have to learn to make it happen, not just desire it to happen. Those who have a lasting impact are

those who not only have the dream but also the drive to press on.

What will your legacy be? Are you living in the past? Are you living discontentedly now, waiting for the future? Will you make the most of this life to give a better life to those who follow? Our animals know this life is a gift, they are making the most of the time they have been given? How about you? What is your legacy going to be?

Longevity in the Animal Kingdom

- In the wild, Golden Eagles (*Aguila chrysaetos*) have been known to live up to 32 years. (Kochert et al., 2002)
- A 55-year-old Sumatran orangutan (*Pongo pygmaeus abelii*), believed to be the world's oldest, died on December 29, 2007. Nonja was born on the Indonesian island of Sumatra and had lived in Miami since 1983.
- A king cobra (*Ophiophagus hannah*) at The Philadelphia Zoo lived to be 26 years old.
- Fifi, a chimpanzee (*Pan troglodytes*) at the Taronga Zoo in Sydney Australia, was 60 years old when she died in July of 2008.
- Pippo, Europe's oldest captive hippopotamus (*Hippopotamus amphibious*), was over 50 years old when she died at a zoo near Verona, Italy in January of 2009.
- In the 1770s, British explorer Captain Cook presented to the Tongan royal family a Madagascar radiated tortoise (*Geochelone radiata*), that died in 1965, making the tortoise at least 188 years old. Several Galapagos tortoises have lived past age 150.
- The best-documented old folks in the animal world are tortoises. In March 2006, an Aldabra tortoise (*Geochelone gigantea*) at the Calcutta Zoo died and was estimated to be 250 years old. A Madagascar radiated tortoise (*Geochelone radiata*) lived in captivity to at least 188. A 176-year-old giant tortoise named Harriet from an Australian Zoo died in June, 2006. Typically, the Galapagos tortoise (*Testudo Elephantopus*) lives 150 years. Other varieties regularly live to be 100.



- Flamingos are long-lived birds: the oldest bird presently at the Houston Zoo is a wild-caught female Chilean flamingo (*Phoenicopterus chilensis*) received in 1975.
- Percy the pelican (*Pelecanus conspicillatus*) came to the Wellington Zoo (New Zealand's first zoo) in 1919 and made it into the Guinness Book of Records as one of the longest living birds in the world, making it to 62 years old.

- In 1949 the Wellington Zoo received a Grey Gibbon (*Hylobates muelleri abbotti*) named Nippy. Nippy was the Zoo's longest serving resident, and the oldest gibbon in the world, before his death in September of 2008.
- Sophie, the longest-lived captive-born male Giant anteater (*Myrmecophaga tridactyla*) in U.S. zoo history, was euthanized on January 31, 2008. Misidentified at birth as a female, Sophie was born in July 1986 at the Jackson Zoo in Mississippi and had lived at the Santa Barbara Zoo since December 1986.
- A clam dredged up off the coast of Iceland has been declared the world's longest-living animal after experts confirmed it had survived for over 400 years. Researchers from Bangor University in north Wales calculated its age by counting rings on its shell. The scientists have named the record-breaking Ocean Quahog mollusc Ming the Clam after the Chinese dynasty that was in power 410 years ago. When Ming was in his infancy, Elizabeth I was England's queen and William Shakespeare was still writing plays! According to the Guinness Book of Records, the officially recognized longest-lived animal is a 220-year-old clam. Unofficially though, Ming's closest rival is a 374-year-old clam currently housed in an Icelandic museum.
- One of the longest living captive lionesses in India died at the Delhi Zoo in January 2003. Jyoti was 25. She was brought here in 1980 from Baroda Zoo as a two-year-old.



- The age of a fish is calculated in much the same way as one works out the age of a tree by counting its rings; most fish have growth rings on their scales known as annuli. This technique was used to estimate the age of Hanako, meaning "flower maid", the world's oldest koi carp, who died in 1977 at the age of 226 years. Goldie, the oldest goldfish, had reached the age of 45 by the time he died in 2005. (Source: Internet Research by Editor)

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